THE
ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER
ESTABLISHED 1872

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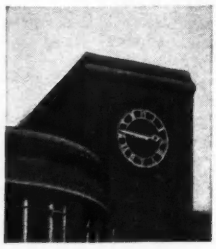

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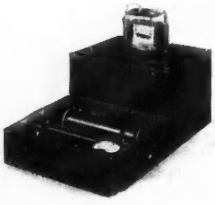

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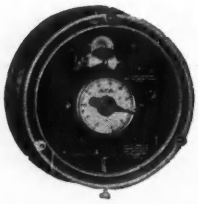

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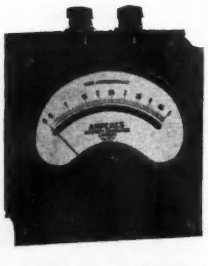

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System Protection

The Performance of Relays and Associated Apparatus

RELIABILITY of supply depends in the first resort upon the efficacy of protective gear, the duties imposed on which become increasingly onerous with the growing complexity of transmission and distribution. The early conception of protective devices as means of ensuring (at best through appropriate time-current settings) the automatic cutting out of faulty sections promptly enough to prevent damage through overloading does not go very far towards meeting conditions to-day.

It is not only that the natural growth of load, entailing the use of larger generating units, has very materially raised the short-circuit kVA and that the interconnection of systems has emphasised the essential quality of discriminative action. The very high speeds required for circuit-breaker operation are due also to the need to secure stability in the parallel running of synchronous machines.

In certain cases, also, protective apparatus must function with unwanted currents that may be only a small fraction of full-load values. As Messrs. J. W. Gallop and H. G. Bousfield put it in an I.E.E. paper last December: "It is fundamental of any protective system that it shuts down the minimum of plant and as quickly as possible" and that the action of relays should depend upon "the unhealthy state of the system and not upon the magnitude of the fault current."

More Information Needed

There is little comprehensive information available regarding the efficiency of the protective gear at present in use on public supply systems. It is a pity that the suggestion made by the E.R.A. some four years ago that undertakings should make returns of their protective gear performance on a common basis was not followed up. A study of results similar to those disclosed then, but on a larger scale, would undoubtedly do much to improve a state of affairs that is clearly unsatisfactory, however inadequate the data for providing any very definite criterion.

During the discussion on the Institution paper embodying the E.R.A. survey, Mr. C. W. Marshall gave the percentage of line faults that was correctly cleared on the grid in 1935 as 68.5 per cent.—a figure 2½ times as good as the average of the E.R.A. returns for the five years ending in 1933. No doubt the latter included many networks in which the protective apparatus was obsolete, but the root of the trouble generally seems to have lain not in fundamental design but in defective procedure in installation and maintenance.

This view is supported by Mr. J. R. Brookman in another recent I.E.E. paper and also by deductions to be drawn from figures included in Mr. Johnstone Wright's presidential address in which it appeared that by 1938 the percentage of correct protective operations on the grid as a whole had risen to 88. No striking developments in this connection had taken place in the intervening period and the improvement may therefore reasonably be attributed to more prolonged experience in maintenance. It should be noted that prior to the construction of the grid there was no first-hand experience in this country of the working of modern methods of pilot-less protection (such as is used for most of the Board's lines) that would serve as a useful guide.

Pilot and Pilot-less Systems

The question arises as to what further improvements are to be anticipated. Mr. Wright referred to an achievement 96 per cent. effectiveness in some grid areas. Presumably these cases included a larger proportion than usual of pilot-wire schemes, and equal and even better results have been obtained by undertakings which depend to a greater extent upon Merz-Price or McColl biased-relay forms of protection.

Unfortunately, the cost of pilot protection (it would amount to £3½ million for the whole of the C.E.B. system) rules out its use for long routes, and so probably no marked advance is to be expected where these prevail and maintenance practice is of a high standard. To go beyond this we may have to await the full development of carrier-current lock-in protection. This method is also expensive, but its cost can be reduced by combining protective duty with communications. In this connection it is significant that a number of capacitor voltage transformers have recently been installed on systems operated at voltages up to 132 kV.

Nevertheless, whatever the future may have in store, whether in new methods or in modifications of existing designs, it is to improvements in the technique of maintenance that one must look for the greatest contribution towards adequate protection.

Steam-raising Questions

AT present it is a moot point whether, in the present international situation, the development of forced-circulation boilers for special purposes will be damped down as a result of a natural tendency to adhere to well-tried practice or whether it will be encouraged through the need to economise material and space. In any event, the attendance at the lecture given last week by Dr. R. P. Wallis to the E.P.E.A. (London Technical Group) is a welcome indication that interest in this aspect of boiler-house practice is not being allowed to lapse. One immediate obstacle to further progress in high temperature work associated with high pressures for either forced or natural circulation is the difficulty of obtaining in wartime alloy steels with the requisite low rate of creep for the stresses imposed. In addition, there are problems awaiting solution in connection with the considerably greater temperature drop through superheater tubes for a given heat transfer with molybdenum steel as compared with ordinary carbon steel. The original idea behind the evolution of the forced-circulation boiler was, we believe, to reduce capital costs. In this connection the most promising field of investigation is still the conditions under which boilers could be made to have the same availability for service as steam turbines, thus reducing the margin of spare evaporative capacity.

Rate-Aid Again

A SOUTHAMPTON newspaper says that it is estimated that in the 1939-40 accounts of the Southampton electricity undertaking it will provide no less than £12,800 in relief of rates, and that Portsmouth will benefit from electricity profits to the extent of £30,000 this year. We do not know whether our contemporary is relying on the estimates prepared before the commencement of the financial year or whether it has inside information, but we cannot regard with favour any suggestion that electricity profits should continue to be "milked" for the general rate fund. The suggestion is particularly inappropriate in the case of Portsmouth, which is putting up its prices. Viewing the general situation, we should say that very few undertakings are in a position to contribute to the rates except at the unwarrantable expense of their consumers.

Educational Facilities

AT the moment the effect on technical training of evacuation and other emergency measures does not appear to have been so serious as might have been expected. Looking ahead, however, there is much to cause apprehension, as Professor R. O. Kapp points out in his article this week. The claims of military service affect all except last-year students, so that if the war is prolonged there is likely to be, not very far ahead, a lack of fully-trained engineers for meeting the requirements of a mechanised army. This shortage is likely to be still more acute when normal times return and reconstruction should be vigorously taken in hand.

Analysis by X-ray

The discovery in 1895-9 by Professor Wilhelm Röntgen, of Würzburg, in Germany, of what are now commonly called X-rays is supposed to have been accidental. However fortuitous the manifestation may have been, there is no doubt that it was the commencement of a new phase in scientific history. The very nature of the radiation itself has been of fundamental interest. This "bundle" of rays has been of inestimable value to medical practice for diagnosis and treatment. In industry, too, radiography is a useful means of revealing the large scale structure, or differences in the macro-structure, of solid bodies. But it is the crystallographic application of this form of radiation that primarily concerns research physicists, for it is the instrument which is unveiling a picture, as brilliant as it is new, of the fundamental structure of matter. The utility of X-rays no longer entirely depends on penetrative power, for their reflection by the regular arrangement of atoms in crystalline substances enables diffraction methods to be employed for the investigation of constituents not otherwise separable, and for the examination of quantities too small for chemical analysis. Moreover, it is possible to do so without destroying the sample. The practical importance of crystal structure, to which most of the physical and chemical properties of solids are related, is well brought out in Mr. H. P. Rooksby's paper at the Royal Society of Arts to which reference is made on another page. The term "amorphous" which is so commonly chosen to describe a substance whose crystallinity is not obviously revealed even by a microscope, must now be employed with caution, for there seem to be very few cases in which it can strictly apply.

"Violent Competition"

IT has often been complained that as an electricity supply undertaking is a monopoly it can do as it likes and often adopts a "take it or leave it" attitude. Maybe there have been a few cases of this nature, but they can only have occurred where there was no gas competition, or a gas undertaking tarred with the same brush. Where the gas undertaking is a "live" one electricity supply will make little headway without a progressive policy. Healthy competition is therefore beneficial to both—and to the public which they serve. Consequently we have never regarded with favour proposals by local authorities who supply both gas and electricity to run the two departments in double harness, particularly as the suggestion usually arises when the electricity department is doing too well for an older-established gas department. We do not say that such is the case at Bradford, where a proposal of this nature has been made by an Economy Committee, but still we are not convinced of the soundness of the scheme. It is said that there is "violent competition" between the two undertakings whose joint publicity and showroom expenses amount to £12,400 per annum. It is proposed, for a start, that the simple hire of apparatus by both departments shall be suspended and that there shall be a joint sales department to supply equipment "without bias to either service."

—in Wartime

NATURALLY the existence of a state of war necessitates a reconsideration of the position. But is the case for joint working very much strengthened? And do not the same objections stand? Unless the business is rigidly apportioned between the departments—only electric cookers and only gas water heaters, for instance—we cannot imagine that bias will be absent. A man who has been selling gas or electric cookers will have acquired some sort of preference which he will undoubtedly communicate to the customer. An alternative is to place gas and electrical appliances side by side in the showroom (chosen by whom?) and say nothing about them, but this is not what showrooms are for.

Effect of Competition

IN comparisons between the consumption of electricity per head of population in this and other countries, references are often made to the absence of water power and the unestimated influence of gas competition here. In Ontario, where electricity comes from hydro-electric stations, natural gas is also available in a few areas. The effect of the latter is shown in the *Edison Electric Institute Bulletin*, which gives the domestic consumptions in 1938 for six towns of from 5,000 to 11,000 inhabitants. For the three with natural gas the number of kWh sold per month per consumer varied from 91 to 113; for those without gas the range was from 163 to 230, which is about the order of things for Ontario as a whole. As the tariff was substantially the same in all cases, the drop in load factor consequent on the use of gas is presumably reflected in the average cost per kWh of 1.6 to 2.2. c. for the first group and 1.1 to 1.4 c. in the second. This is some kind of an indication of the difficulties supply undertakings are up against in Great Britain.

BREWERY INSTALLATION

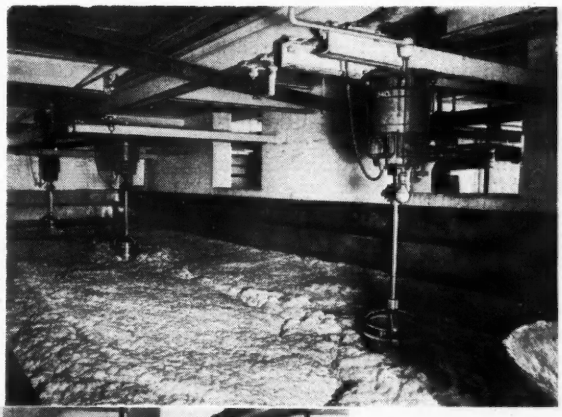
Modernisation and Change-over Schemes

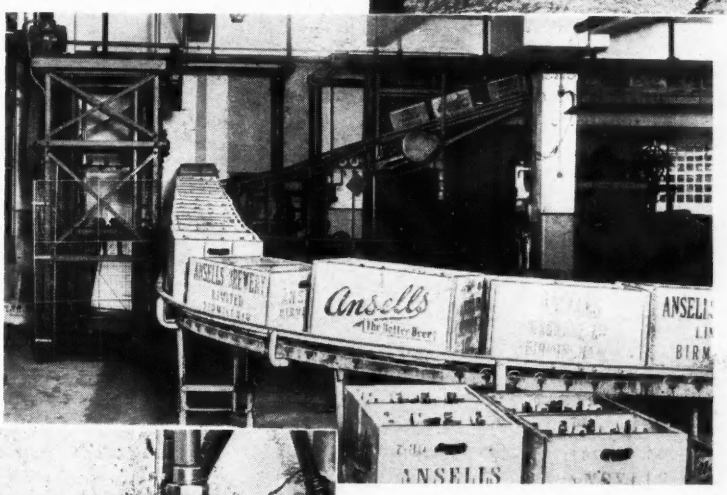
ALTHOUGH beer brewing involves some of the oldest of manufacturing processes, it was soon evident to us during a recent visit to the Aston (Birmingham) brewery, by the courtesy of Ansell's Brewery, Ltd., that where pace is kept with rapidly increasing business demands and with technical development, the electrical engineer is faced with ever-changing problems. Further, a DC to AC supply change-over scheme at the brewery is now about two-thirds completed, and in this connection opportunities are being taken to effect further improvements in the operation of the brewery.

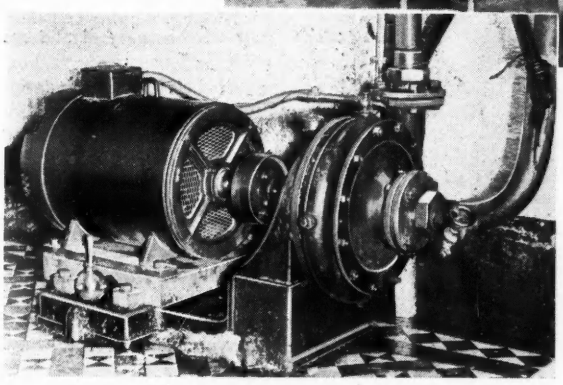
The primary essential material for brewing is malt, and this requires a moderate amount of plant for its reception, handling, storing and grinding before it is used in the first stage of brewing, known as mashing. The actual malting process is not carried out at the brewery. In 1½-cwt. bags the malt is delivered to an endless-chain elevator for conveyance to the malt rooms, the elevator having a straightforward drive by a 6-HP motor. When it is required for processing, the malt is first treated in torrefiers, that is, slowly rotating cylindrical drums through which hot air for drying is also passed. The torrefiers have very large ratio speed reduction drives, *via* belt and gearing, and they represent a good instance of the benefits obtained by the use of ammeters in the motor circuits; it is possible for the attendant to leave the drum doors open, causing overloads on the extraction fans. Since the introduction of the ammeters, troubles such as motor overheating, excess consumption and belt transmission difficulties have vanished.

The freshly torrefied malt is delivered to the mills for immediate grinding. There are a 16-quarter Boby and other smaller mills, but for the sake of standardisation 12-HP, 960 RPM motors provide convenient drives for the mill speeds required. The ground malt is elevated into grist cases from which the mash tuns are fed. Up to the present the rakes and mashers have been served mainly by a steam engine which originally drove the larger part of the brewery equipment. Because of the few hours this engine was required to run, electrification was considered to be hardly justified, but this idea is now being abandoned because the great space occupied by the steam plant is a much more important factor. Wort, the product of the mash tuns, goes through the various boiling processes, with the addition of hops, etc., and the handling of the liquid is effected by a number of centrifugal pumps of various capacities requiring motors of from 1½ to 8 HP.

In the change from wort to beer fermentation takes place on account of the familiar change of sugar with yeast, and a modern development in this connection is the use of rousers which lift the beer in the fermentation vessels and spray it over the yeast froth at the top. Rousing takes place about every two hours during the fermentation process and the agitation allows the escape of CO_2 and helps to bring fresh air to the yeast. A rouser is a non-ferrous hollow cone open at the bottom and rotated at various speeds on account of the varying heights and densities of the treated liquid. As this cone is immersed in the liquid, centrifugal action draws the beer up the cone until it reaches the top, whence it is sprayed over the surface of the yeast. The rouser motors are flange-mounted to the roof girders and drive the cones by means of long steel shafts. The motors are ¼-HP totally enclosed, ¼-hour rated DC machines with a speed variation from 420 to 720 RPM. They were specially designed by Higgs Motors, Ltd., to meet the necessity for a totally enclosed lightweight, heavy-duty variable-speed machine. The rousing apparatus was invented and designed by Mr. W. Scott, joint managing director of Ansells.







Above: Open-type fermentation vessel with direct-coupled motor-driven rousers. Left: Dispatch dock showing conveyor and elevator from stock room. Below: Wort circulating pump drive showing adaptor plates

All air in the new wing is filtered, and the excess CO_2 is extracted from compartments around each fermentation vessel and delivered outside the building. This requires a considerable number of fans (about 28), in addition to about a score of other fans which are used over the open-type vessels. Here, again, very considerable economies have been effected during the change-over by reducing the fan speed and adopting

direct-coupled motors which were specially built so that the change could be effected without altering the foundation bolts of the old motors.

During the fermentation process the liquid in the vessels is kept at a constant low temperature by cooling coils through which a regulated supply of water is passed. This, together with other processes in brewing, requires a large amount of cold water which must also have certain qualities to make it suitable for brewing. These requirements are met by an excellent supply of cold water from boreholes beneath the brewery. The original borehole pumps were steam driven and of the bucket type. A later borehole was fitted with an air lift, and the last to be constructed has a deep-well turbine-type pump driven by a motor which is automatically started and stopped according to the water requirements.

Cask-washing plant, showing motor-driven pumps

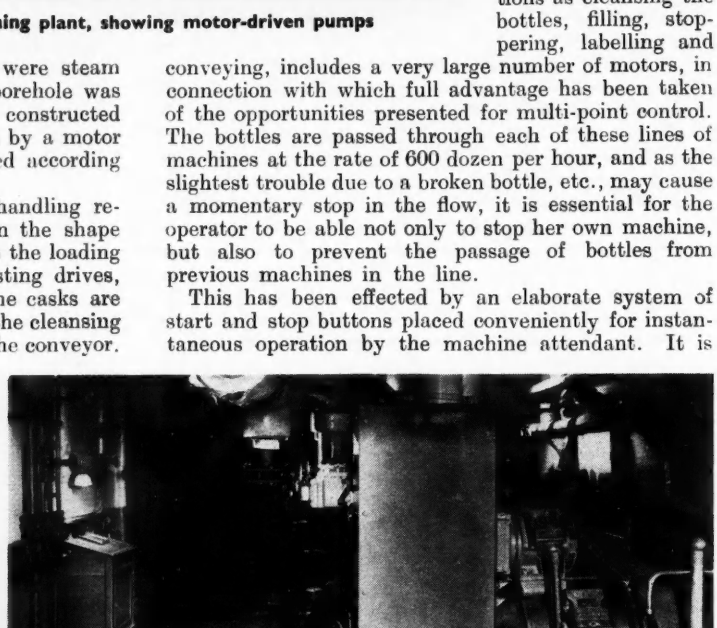
After fermentation and racking, cask handling requires a fair amount of electrical plant in the shape of elevators for the delivery of the beer to the loading deck. Cask washing involves some interesting drives, both for the special conveyor on which the casks are mounted during washing and for pumping the cleansing fluids into the casks at suitable stages on the conveyor.

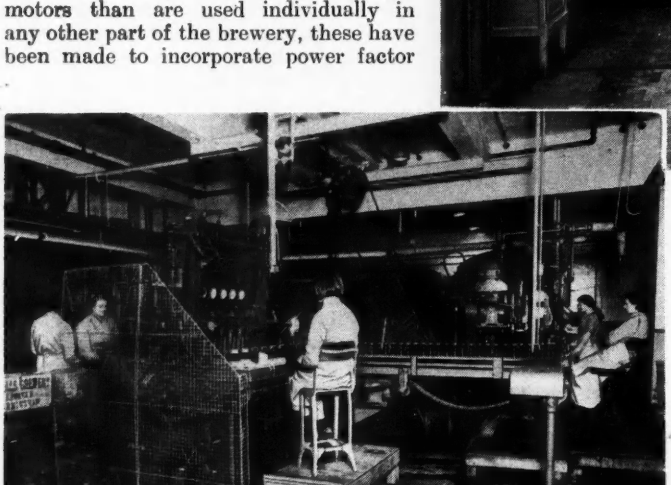
Conditioning Process

An increasingly important side of the brewing industry is the bottling of the beer, and it is in this direction that the more recent developments of Ansells call for a very considerable amount of electrical plant. For conditioning, an essential prelude to bottling, there is an extensive refrigerating plant, and as the ammonia compressors require larger motors than are used individually in any other part of the brewery, these have been made to incorporate power factor correction. The original scheme called for only about 37 and 50 HP for the conditioning and chilling-room compressors, with provision for increasing the capacity of each compressor by 100 per cent. at a later date. It was decided that the phase advancer had considerable advantages for this class of work over the auto-synchronous motor, and by adopting a motor with an advancer suitable for a leading power factor of 0.5 at the outset with the lower horse-power, it was found that the increase in output required up to the full 100 per cent. could be obtained on the same motors, though with less leading capacity at the highest load. This scheme has worked out extremely well.

For the filtering and treatment of the beer during conditioning, the electrical equipment includes a number of centrifugal pumps driven by 3- to 4-HP motors, and motors of from 5- to 7½-HP for driving shafting for stirring the beer in the conditioning tanks. The bottling plant, which embraces such operations as cleansing the bottles, filling, stoppering, labelling and conveying, includes a very large number of motors, in connection with which full advantage has been taken of the opportunities presented for multi-point control. The bottles are passed through each of these lines of machines at the rate of 600 dozen per hour, and as the slightest trouble due to a broken bottle, etc., may cause a momentary stop in the flow, it is essential for the operator to be able not only to stop her own machine, but also to prevent the passage of bottles from previous machines in the line.

This has been effected by an elaborate system of start and stop buttons placed conveniently for instantaneous operation by the machine attendant. It is undesirable to place the starters themselves in such positions, as many parts of the machines are necessarily subjected to frequent and liberal treatment by the hose pipe. Further, it is cheaper to put in watertight stop buttons than watertight starters. The individual motors vary in size from about 1 to 3 HP, and all those for driving the bottle conveyors, etc., which must be placed very close to the work, are totally enclosed. The direct-on-line starters are arranged centrally in groups with sub fuse boards for each bottling line.



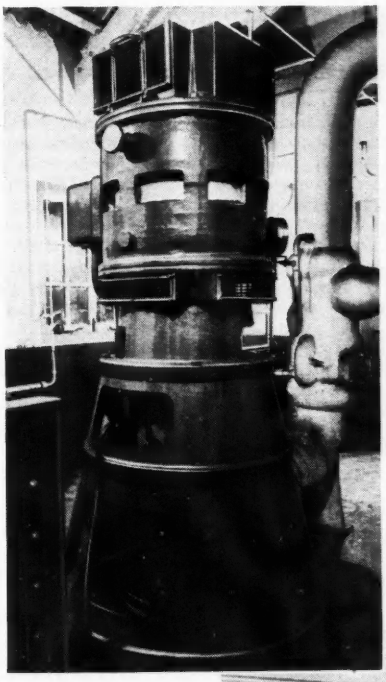


Above: Ammonia compressors in the bottling stores with phase advancers for p.f. correction. Left: Bottling line for filling, capping and labelling operations; push-buttons near attendants

Distribution Scheme

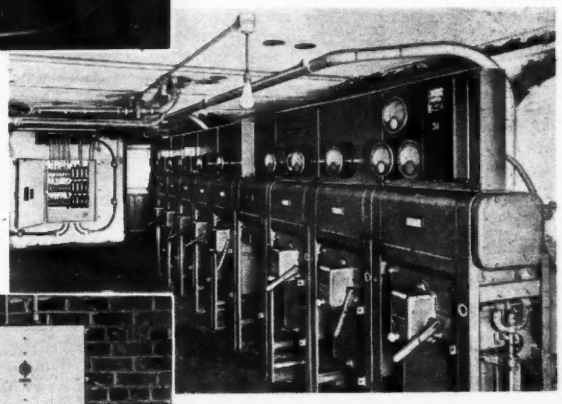
Electricity is received from the Birmingham Corporation at 3 phase, 50 cycles, 11 kV, and in addition to the two ring-main panels, another affords a tee connection for the consumer's supply. On the consumer's panel there is provision for metering separately the total load, the night and week-end supplies and the wattless current for power factor calculation. For the control of the three 400-kVA transformers there are three

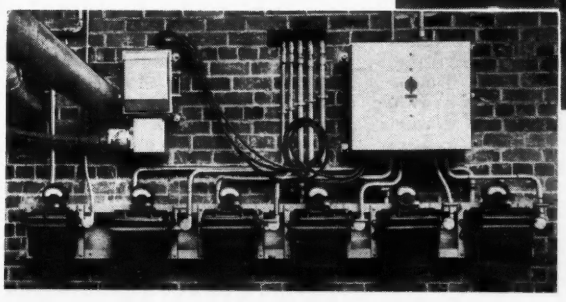
similar panels of the same make (Ellison). The low-voltage main switchboard is equipped with Crompton "Klad" type oil circuit-breakers, and this board is divided into lighting and power sections, with a bus-bar coupler, so that in an emergency either lighting or power or any combination of the loads can be dealt with by any combination of the transformers.



Although the sub-station is located near the load centre of the brewery, the long distances to the lighter load sections necessitate a further distribution centre, which is supplied by three 0.3-sq. in. feeders with circuit-breakers at each end of each line. The smaller local feeders for power and lighting are controlled by two Ellison switchboards with their bus-bars directly connected to the bus-bars of the main board. Considerable difficulty was experienced in finding a good cable route to the brewing distribution centre, partly because the underground boiler house and the copper room, where the wort is boiled, stretch right across the path, and partly because the hot, steamy conditions were likely to cause cable troubles. This difficulty was overcome by selecting a cable route overhead on the malt conveyor bridge up to the top of the brewery and then down again after the obstacles had been passed. In view of the considerable height to which these cables were taken a special type of paper insulated cable was supplied by British Insulated Cables, Ltd., and there has not been a single case of oil seepage.

In the brewery distribution centre a "Klad" switchboard deals with the bulk supply to the power and lighting main fuse boards, and accommodates other feeders to the deep well pumps, etc. The main protection for the whole of the distribution is by means of low-voltage-circuit-breakers, but with ordinary re-wireable fuseholders trouble was experienced through the main high-voltage group circuit-breakers operating simultaneously on low-voltage short-circuits. The supply authority insists on providing instantaneous tripping on the consumer's h.v. panel in the sub-station, and although the setting is much above any sustained overload on the whole plant, local l.v. equipment could interrupt the whole supply. This trouble has been largely overcome by the use of English Electric high-rupturing-capacity cartridge fuses for all main sub-circuits on both power and lighting.





Top: Automatically controlled borehole pump. Middle: Main distribution centre with local distribution board in rear. Bottom: Centrally situated starter equipment for cask-washing plant

The use of high-rupturing-capacity fuses has also been found advantageous on sub-fuse boards, but a slightly longer time lag is desirable where motor protection is involved, and for this work fuses by Parmiter, Hope & Sugden, Ltd., have been found to provide the desired characteristic. For the necessary re-wiring between the sub-fuse boards and motors, a compromise has usually been made, in some cases by entirely replacing conduits where internal corrosion had made this desirable. In other cases the existing conduits could be used to a considerable extent, and in these instances the procedure was to draw out the existing wires for the DC motor and to suspend them temporarily and remake the conduit ends to the new starter after having ascertained that earth continuity was maintained during the change-over. All new conduit, however, was supported on distance saddles to prevent the accumulation of dirt and the trapping of the condensate at the back of the conduits and to facilitate complete painting—an important point in brewery work.

Change-Over Problems

The whole of the brewery proper and a small portion of the bottling stores had been equipped with DC motors prior to the extensions, but because of the generally more favourable conditions pertaining to the supply and use of AC it was decided to change over the greater part of the DC plant in the brewery. A completely new layout of conduits and cables was necessary, and this enabled the change-over to be effected in easy stages without interfering with the operation of the brewery. To guard against condensation troubles the conduits are galvanised, all exposed threads have been carefully treated with aluminium paint, and at the lowest point of every run or section a drain-out is provided to prevent accumulation of the condensate.

The absence of special speed control has not been found disadvantageous on AC, but for certain fans for grain dryers two-speed motors provide the practical speed variation required, and for the motors driving feed screws variable-speed pulleys have been successfully adopted. For 95 per cent. of the drives in the brewery suitable speeds are afforded by AC motors, whether direct coupled or with other forms of transmission, and only for some small turbine pumps has it been found necessary to improvise a belt drive to give the required pump speed. As the AC motor has smaller dimensions than the DC machine, mechanical modification in dimensions has been effected by cast-iron adaptor plates which utilise the old fixing holes and provide the new fixing holes for the AC motor, maintaining both height of centres and correct location for the end of the shaft. Generally the cost of the adaptor has been only a small fraction of the difference in cost between the DC and the AC motor.

We are indebted to Ansell's Brewery, Ltd., for permission to visit the brewery, and to Mr. Elsmere Harris, chief engineer, and Mr. R. P. Hulse, B.Sc., consulting electrical engineer, for their help.

TECHNICAL EDUCATION

Students' Progress in Wartime

By Reginald O. Kapp, B.Sc., M.I.E.E.

MANY of us expected that technical education would suffer severely during a war. No more than a small fraction, we thought, of the number of peacetime students would be precariously taught by depleted staffs during the intervals between frequent and devastating air-raids. It may be so before the war has ended; who knows? But so far those of us who thought thus have been proved false prophets. This has turned out to be a war in which the expected does not happen. The anticipated knock-out blow has not been delivered. In the provinces, indeed, universities and technical schools have hardly been affected at all.

The author is Pender Professor of Electrical Engineering at University College, London

Technical education in the various London institutions has fared worse, but what has happened there can hardly be described as exceeding a more or less considerable inconvenience. All the London technical colleges were closed for a while after the outbreak of war. This was only because of the high standard of precautions first demanded by the authorities. If it could be attained even practically, such a standard certainly imposed economic demands which the colleges were not able to contemplate. As soon as the restrictions were relaxed the technical colleges put such measures into effect as would render their students and staffs reasonably safe and reopened for normal teaching.

Other teaching institutions as well as the numerous technical schools are also available to engineering students in London. Birkbeck College, for instance, provides intermediate science training and the City and Guilds is open for post-intermediate undergraduate study. Hence a young man who lives in London can attend all the courses which lead to a London degree in engineering, internal or external. Permission to continue in London has not been accorded to all the institutions forming part of the University of London. King's College and Queen Mary College have been evacuated to two university towns. University College has suffered more drastic treatment and has been widely scattered. The administration, together with the Faculties of Arts and Laws and a portion of the Chemistry Department, are at one place in the west. The Faculty of Science is at another provincial town. Medicine is split between two towns remote from one another. Scientific researches are being continued in yet other places and the Faculty of Engineering has been sent to South Wales.

Effect of Changes

Such dismemberment and transplantation of the University of London have had their effect. First, they have caused a substantial reduction in the number of students over and above what the war would have brought about in any case. Inevitably national service, and sometimes only the anticipation of national service, have already taken their toll and there will continue to be a steady leakage of undergraduates into the fighting services. Inevitably, too, some parents have been made poorer by the war and can no longer afford to let their sons continue their studies. These causes of loss to technical education have not yet operated very strongly and they affect, moreover, all institutions alike, evacuated or not.

A further cause in the case of the evacuated colleges may have been the additional cost of living away from home. This does not seem to have affected numbers of applicants at all seriously and it should be noted that fees for engineering are those payable at the receiving university and are on a lower scale than in London. This saving in fees goes some way towards meeting the cost of lodgings. As these, too, are generally cheaper than in London those students whose homes are not in London gain financially by the move. But where the cost of living is higher than in London a poor student may find difficulty in pursuing his studies.

If and where all applicants can be taken, therefore, the numbers taught need not be substantially below the peacetime figure. But at the smaller receiving universities space restrictions are serious. Thus at University College only those students could be admitted who were already on the register of students at the outbreak of war and who had not previously interrupted their studies. These had a right to be accommodated. But all on the long waiting list, whose acceptance would largely have been almost automatic without the war, had to be rejected. Even so some three times the number have to be trained than was anticipated when the order for evacuation was given. This has necessitated a certain amount of improvisation. The nature of laboratory work has been adapted to the available resources; classes have been duplicated; extra equipment has been imported from London, and trestle tables serve as rather shaky drawing benches.

If the war has not yet taken too heavy a toll among the students, neither has it done so among the teaching staffs. University College, for instance, has lost barely more than half a dozen teachers in the Faculty of Engineering. The loss would have been serious if the college had remained in London. But by pooling resources with the receiving university it can largely be made good.

Though, therefore, there has been no marked loss in teaching power, there may have been some slight loss in learning power among the students. If so, it is hard to assess. Uncertainty as to their future may discourage some of those who are approaching military age. Hard study will not always seem worth while to a man who knows that he will not be allowed to stay the course. Where, for the sake of economy, several students share rooms they may also be somewhat handicapped in their studies. But the author has not noticed any deterioration in performance from such causes.

Loss of Cultural Background

The severance of a single faculty from the corporate body of a university is a serious matter. An advantage of a university education over that obtainable at a technical college is in the cultural background to the student's life which is derived from the assembly in one institution of all departments of learning. Some of this advantage is lost by the drastic curtailment of students' social activities due to air-raid precautions. The advantage is still more lost when the university is broken up into fragments and dispersed. It appears, therefore, that at least in its present stage the war will not lead to any appreciable lowering of the standard of undergraduate work or of the value of an engineering degree. At most there may be some reduction in the amount of laboratory work performed wherever lack of space and equipment in the receiving university is serious. The early closing of laboratories, workshops and drawing offices in the interests of air-raid precautions during the winter months also curtails the amount of time a student can devote to his course-work.

Post-graduate work is bound to suffer more severely in the evacuated colleges, and to a smaller extent at the others as well. Even if not of the calling-up age, graduates will naturally look for some form of national service in preference to the more academic work which they would have chosen in peacetime. The University of London has, moreover, relaxed the regulation which obliged a student who had passed his degree examination after two years in the university to complete a further year's residence devoted to post-graduate work. A student engaged on national service will be excused this requirement during the war. There is the further fact that the evacuated colleges can find neither the space nor the opportunity for research on the scale and of the nature which they could conduct in their own homes. Except, therefore, for what can be done in the high-voltage laboratories of Queen Mary College which are still open, engineering research must be in abeyance or severely curtailed.

"Teaching almost as usual" would, therefore, be a justifiable slogan for this war up to the present. Whether such teaching will continue to furnish an adequate supply of trained engineers is not so certain. There is a grave risk that if the war continues for some years the supply may fall disastrously behind the demand. At present only those students who are in their final year are given exemption from military service in order to enable them to complete their studies. This ensures that in a year's time there will still be a good supply of properly trained degree men. But students in earlier years of their training are not given exemption. So there will be a substantial reduction in the number

(*Continued at foot of next page.*)

WARNING SIRENS

Prevention of Trouble from Snow and Ice

By P. d'E. Stowell, B.Sc., A.M.I.E.E.

IN cold weather exposed air-raid warning sirens may fail to operate through snow choking their rotors, or through the rotor and stator becoming wet and freezing together. Even if this does not occur there is a very real proba'bility that water which collects in the bottom of the rotor when it is stationary will become frozen. The siren might thus run up to its full speed of 2,900 RPM with the rotor badly out of balance, possibly with disastrous results.

This potential trouble may be avoided by running the sirens continuously at a low speed. Experiments with standard 4 HP sirens have shown that a satisfactory speed is about

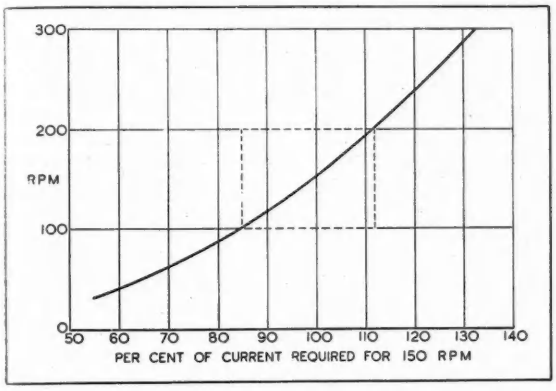


Fig. 1.—Practical speed-current range

150 RPM, at which the noise is barely audible 50 ft. from the siren, even in a quiet locality. In places where the background noise is higher or where the siren is a considerable distance from private dwelling houses the speed can be increased up to about 250 RPM.

For practical purposes between 100 and 200 RPM may be satisfactory. This wide range is given because the speed control is fairly critical, covered by a change from 85 to 112 per cent. of the current required at 150 RPM. The current required to drive the sirens steadily at 150 RPM also varies appreciably for different sirens, approximately from 2.2 to 3.3. A ber phase after steady conditions have been established. Initially, when a siren has been standing still for a long period in cold weather about 5 A per phase is necessary to drive the machine at 150 RPM, but as the bearings become free after running for a short time the current required falls rapidly.

Once the speed has been determined for any particular value of current, the corresponding current for any other speed can be determined from fig. 1, but before any final settings are made it should be established that the friction has become stable by running for a short time with a higher current than the final value. To obtain this reduced current impedances are connected in parallel with each phase of the control contactor as shown in fig. 2. When the siren is required to operate in a normal manner the contactor simply short circuits the impedances and applies the full 400 V.

The impedance required to give a current of about 2.5 A per phase may be either a resistor or inductor, but a capacitor is the most desirable because it has a negligible loss, whereas a suitable inductor will consume almost as much energy as the siren itself, and a resistor more than ten times as much. A capacitor is about half the cost of an inductor for this duty; it will take a leading current and improve the power factor of the network, whereas an inductor gives a heavy lagging load.

If capacitors are used and a speed of 150 RPM is decided upon the sirens will require between 30 and 40 μF per phase, depending upon their friction. Suitable values may very well be obtained by using in parallel the 15 and 20 μF condensers normally employed for correcting the power factor of 250-W and 400-W mercury-vapour street lamps, now standing idle.

The fuses shown in series with the condensers in fig. 2 should be rated at about 5 A to carry the condenser current, but to open the circuit on the 40-A starting current taken by the siren at 400 V in case any of the condensers should fail.

The power consumption of the sirens when running at reduced speed is about 4.5 W per phase per A^2. With 2.5 A per phase the power input will be $4.5 \times 2.5^2 \times 3 = 84.4$ W. This input is of the order of 15 per cent. of the total losses in the motor itself when it is running at full speed, and it is sufficient to maintain the motor at a temperature of about 10 deg. F. above the ambient air temperature, thus preventing any possibility of condensation troubles in it.

If the sirens are operated in this way for about four months,

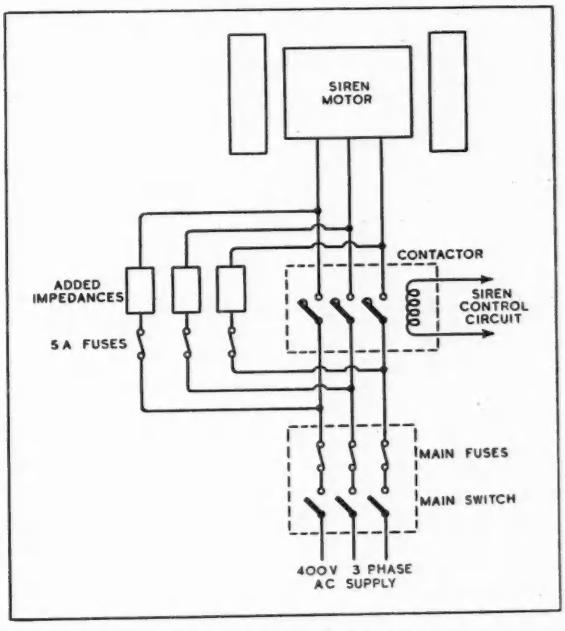


Fig. 2.—Impedance-control circuit diagram

or 3,000 hours per annum, the running costs will be as given in the following table for the various sizes of condenser mentioned above, assuming electricity costs 1d. per kWh.

μF. per phase	A per phase at 400-V.	Total W. input	kWh for 3,000 hr.	Cost of electricity for 3,000 hr. as 1d. per kWh. £ s. d.
30	2.32	73.2	219	0 18 3
35	2.74	102.0	306	1 5 6
40	3.18	137.5	411	1 14 3

In calculating the current per phase from the capacitance, it is necessary to take into account the reactance of the siren motor, which at low speeds is about 7.2 ohms per phase; as it is inductive it has to be subtracted from the reactance of the capacitor, which does not affect the operation of the siren in normal use.

This system has now been adopted in Edinburgh, and on the sirens so fitted it has been found to work satisfactorily through a period of severe frost, whereas others which were stationary became frozen solid.

Technical Education (*Concluded from page* 64)

of qualified engineers in 1941 and, if the war lasts so long, an even greater reduction in 1942.

For some years there have been more jobs than students. In this war where the technician counts for so much the demand is likely to exceed that hitherto experienced. So the prospect that the supply of qualified engineers issuing from our universities and technical schools will become more and more meagre must be regarded with apprehension. The country will not be able to maintain its position in engineering either in war or in peace unless our teaching institutions can continue at full strength.

The present limitation of exemption to the final year may be due to a commendable wish to make no discrimination in favour of one class. But in these days an engineering undergraduate is more likely to be cook's son than duke's son. Discrimination in favour of engineering students is certainly not discrimination in favour of the propertied classes.

DISUSED TORCH BATTERIES

Reclamation Process Described

By C. C. Downie

ONE result of the "black out" will be that large quantities of spent dry batteries will accumulate on waste heaps, and it is worth while considering whether a reclamation process previously used might be revived.

With an unclassified number of torch batteries of different shapes and sizes, the only means of rapidly opening them up to get at the contents is to pass them through a "breaker" mill similar to those used for breaking down ores and minerals to rough nut-size. Their finely-powdered contents are liable to fly in all directions when the cell is first broken, unless provision is made for this contingency. For this reason, a type of pan mill with the rolls operating in comparatively loose condition was first used for this purpose. The sides of the cell were rapidly crushed and the inner contents ejected without the scattering of fine powder. More recently a form of balloon has been fitted to the reduction plant so that all dust can be completely collected. The balloon is made of light fabric, surrounded by a string net that is suspended from an overhead beam, and is emptied at the conclusion of operations.

Whether the initial treatment is carried out in a "breaker" or a pan-mill, the process has to be finally performed in the latter type of mill, so that all metallic zinc will be given an opportunity to flatten out. The most scientific method of immediate removal of such zinc would be with assistance of an electro-magnetting machine, since all zinc would be drawn to one side, leaving the powdered contents for direct treatment, but these machines are used almost exclusively by mining concerns.

Much of the zinc will be thin as the result of corrosion, but not so thin that it will not hold together. Accordingly, the product from the milling treatment is passed through a series of riddles whereby the zinc is separated. Although discoloured, and of thin section, the zinc is of good quality and is quite suitable for re-melting, but it requires to be washed with water to remove any ammonium salts which may remain on the surface, otherwise this would lead to undue melting losses because zinc would pass off as the volatile chloride. Hence the riddled metal is placed in perforated buckets, dipped into a tank of water (preferably hot) and allowed to dry before going into the melting kettle.

Recovering the Constituents

As the small size of the pieces tends to increase melting losses, the best plan is to have a bath of molten zinc first prepared, and then thrust the former underneath the surface. Any manganese dioxide, or other salts, remaining on the surfaces is caused to float so as to be readily skimmed off with ladles prior to the zinc being cast into flat-shaped moulds, ready for re-use.

The fine material consists of manganese dioxide, zinc chloride, ammonium chloride, and carbon, and is directly charged into a small vat and treated with dilute hydrochloric acid. The method of charging is important to facilitate easy solution, and although heating is to be recommended for rapid working, a good mechanical stirrer is quite suitable. Dilute cold hydrochloric acid is almost without action upon manganese dioxide, and if the mass is allowed to enter slowly in a fine stream with constant stirring, all zinc chloride and ammonium chloride will almost immediately pass into solution. These salts form a double chloride of zinc and ammonium, and one need not attempt to separate them, as they are of as much value in this combined condition as when disposed of separately.

The clear liquor is drawn off by means of a syphon after the action is complete (leaving behind a black mass of carbon and manganese dioxide) and is evaporated slowly to the point of crystallisation. Excessive heating must be avoided as the combined salt is very easily decomposed. The crystallised salt, zinc ammonium chloride, is widely used as a flux by solderers and galvanisers, and when recovered from the foregoing process is sufficiently pure for all ordinary commercial purposes. More protracted distillation has to be introduced when it is desired to recover the ammonia separately, but this was abandoned when the system was last used.

Separation of Manganese Dioxide

The black sludge of carbon and manganese dioxide is transferred to a series of cylindrical tanks and stirred up with water, whereby the heavy manganese dioxide gets the opportunity to separate from the much lighter carbon. Manganese dioxide has a specific gravity of 4.8, while that of carbon approximates to 2.2. The earlier process consisted of simply roasting the mixed mass so that the carbon was burned off and was lost, while the effect of the reducing action was to vitiate the purity of the dioxide condition, which was partially converted to other oxides of manganese, and hence not so suitable for further utilisation by battery makers. By the gravity separation method the mass first enters one tank, is stirred up with water, allowed partially to settle, and the lighter carbon is then run off to a sump where it is allowed to separate out. After some time has elapsed the settled mass in the tank is transferred to a second tank and the process repeated until the manganese dioxide is free from carbon.

Although perhaps at first sight appearing to be circuitous, the treatments can to some extent be carried out simultaneously so as to save time. Thus the final and more vigorous washings of the manganese dioxide tend to cause carbon recovered at this point to be slightly admixed with the former, but this is compensated for by the fact that the latter is continuously transferred to another tank to allow the heavier material to separate out. Except for the hydrochloric acid, no reagents are used, and the zinc, zinc and ammonium chlorides, carbon, and manganese dioxide, are recovered at the cost of plant depreciation and labour alone.

Ramsgate Air-raid Shelter

A CONSIDERABLE quantity of Edison Swan cable has been used in what is no doubt England's finest air-raid shelter. This is the Ramsgate tunnel scheme, which has been visited by A.R.P. experts from all over the country. More than four and a half miles of tunnel are linked together under the town, providing accommodation for 34,000 people. Further extensions are contemplated, and eventually every inhabitant of Ramsgate will be able to find shelter during air raids. The depth varies from 30 to 75 ft., and entrances have been constructed at various points in the town, so that no one is more than a few minutes' walk from the nearest.

The scheme was officially opened by the Duke of Kent some time ago, but is still uncompleted, although over £60,000 has already been spent, mainly in wages. Except for half a mile, it has been newly excavated out of the Ramsgate chalk subsoil. The original half-mile was the disused railway tunnel which served the old harbour station, closed down several years ago. The main tunnel forms a rough semi-circle under the town, with entrances in the cliff face at two points on the lower promenade. There are various branch tunnels, one of which is the old railway tunnel mentioned above.

Seating accommodation, dressing room, lavatories, and first-aid posts have been built in all parts, and, working off the local relay system, loud speakers give continuous radio programmes everywhere. Electric light and water are laid on, but so far these are of a temporary nature. The lamps are hung in festoon fashion on c.t.s. cables at every few yards. Power is supplied by the Ramsgate and District Electricity Supply Co., Ltd., which carried out the electrical work. Emergency lighting is at present by hurricane lanterns, but the full scheme provides for an emergency lighting plant.

In Aid of Red Cross

FRIENDS of the Red Cross have made use of their different interests and pursuits to increase its funds. On February 8th, 9th and 10th at the Horticultural Hall, Westminster, the National Exhibition of Cage Birds, organised by *Cage Birds*, will be held in support of the Red Cross and St. John Fund. An entry of over 6,000 birds has been secured—the greatest number ever included in one exhibition in the history of cage bird shows. Visitors to the Show, which will be open from 2 p.m. to 9 p.m. on Thursday, February 8th, and on Friday and Saturday from 10 a.m. to 9 p.m., will be able to hear a talking Mynah mimic "Lord Haw Haw." The admission price will be: Adults 2s., children under twelve 1s.

FACSIMILE TRANSMISSION

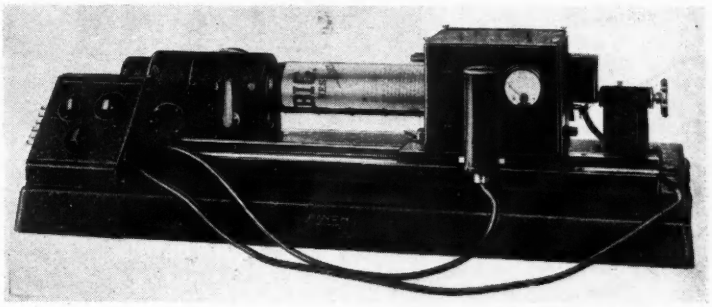
Systems in Use in the United States

By G. Herrick

TRANSMISSION of the printed page, drawings, photographs, documents and original messages by radio or wire telegraphy is making rapid progress in the United States, though certain electrical problems, more commercial than technical, have yet to be solved, and it is necessary to proceed with further development of the best type of paper for recording purposes.

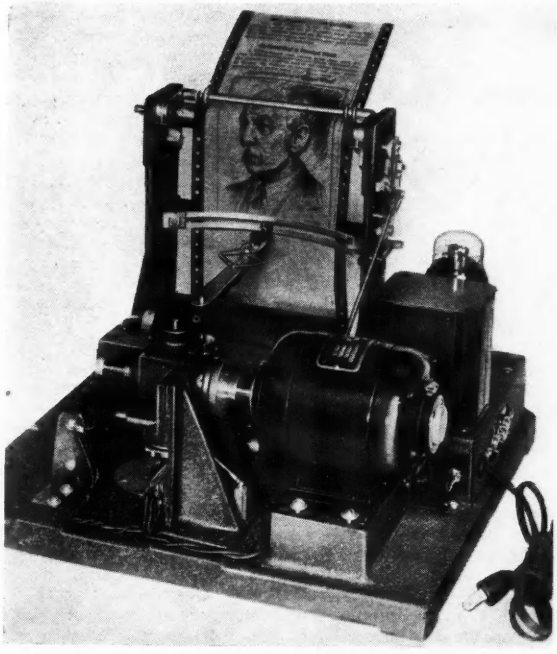
Quite recently when President Roosevelt went to Canadian waters on a fishing trip, on board the United States cruiser *Tuscaloosa*, he received a total of about 50,000 words of news on a facsimile receiver in his office-cabin, while the ship's officers received the same news on a duplicate receiver in the vessel's office.

The information transmitted was gathered by Trans-Radio News, set in type by the Koppel Printing Co. in New York and broadcast from Cartaret, N.J., by the Finch system of transmission over the regular 780 kc used by the station WOR of the Mutual Broadcasting Co. The transmissions, in the afternoon, were received in the *Tuscaloosa*, which reached a maximum distance of 650 miles from the transmitter. As the ship returned and neared New York the Finch Telecommunications Laboratories, with their smaller transmitter at 1,819, Broadway, New York, took over transmission.



Finch facsimile transmitter

For the transmissions AC at 110 V and 60 cycles was used to energise both the transmitter and receiver. The Finch system's own design of synchroniser was essential in this case on both transmitter and receiver because of fluctuations in the current generated. This has been one of the obstacles to be overcome in the development of facsimile transmission, for power stations in different States vary in frequency. For example, it is difficult, unless synchronising equipment is used, to transmit facsimile messages between a transmitter in New York and a receiver in the adjoining State of New Jersey. Yet a transmitter in New Jersey can send facsimile matter into the State of Pennsylvania without much difficulty. In a ship at sea synchronisers are essential to compensate variations of up to two cycles which are likely to occur in the power delivered.



Receiver with cover removed

At present there are three systems of facsimile transmission of printed material and pictures being developed. The R.C.A. system is controlled by the Radio Corporation of America and uses what is called "percussion" recording through varying electrical impulses which record lines on any grade of paper through the medium of a carbon sheet. It makes clear recordings in most cases, but operates at only about three feet an hour. However, it has been tested with good results by certain American newspaper publishers, including the *St. Louis Post-Dispatch* and the McClatchy newspapers in Sacramento, Cal., each of which has more than 50 receivers on loan to subscribers as part of experimental work.

The system controlled by Finch Telecommunications Laboratories records on special paper that is basically black and coated with an "eggshell" surface. Across this an electric stylus travels, being regulated by impulses received at standard radio frequencies, or over a telegraph or telephone wire. The stylus draws 100 lines to the inch and by oxidising the surface coating to a greater or lesser degree records a variety of shades of grey down to black.

The system of Mr. J. V. L. Hogan, consulting engineer, of

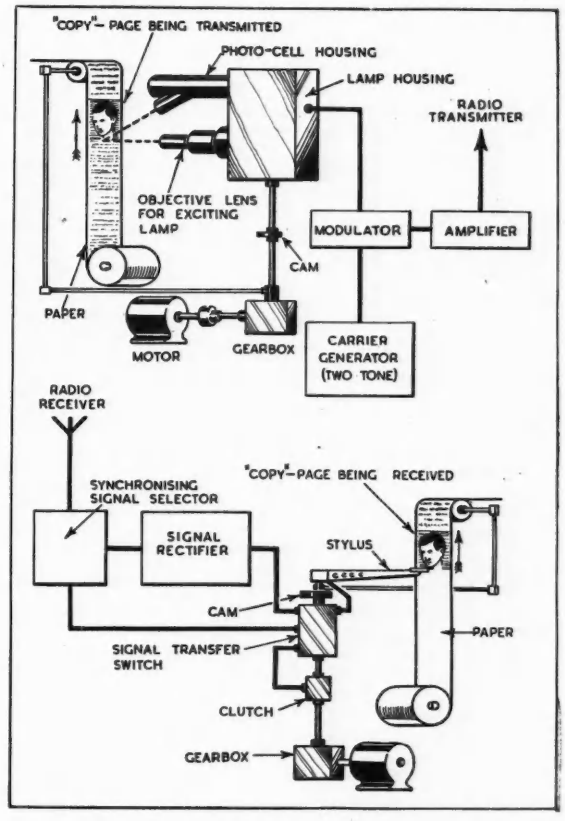


Diagram showing principles of operation of transmitter and receiver

New York, was used with interesting results at the Toronto Fair by the *Globe-Mail* of that city. This method also employs the stylus principle of recording. Instead of oxidising a specially coated paper, a series of points that are in contact with specially sensitised paper in rolls deliver varying electrical impulses to the paper and "develop" or "print out" the required type or picture as the paper unrolls in the receiver. This system is extremely clear and can record very small details, such as a photograph of a lace tablecloth, or type down to 6-point.

All three differing systems require the material to be transmitted to be placed on a revolving drum, or cylinder, so that it is scanned by a point of light with which is associated a photo-electric tube that reacts to the reflections of light from light and dark surfaces, varying the impulses sent out.

Facsimile transmission is said to have been conceived in 1839 and patented by a Scot, who later fought a legal battle with Alexander Graham Bell over patents on the telephone and succeeded in restricting coverage of those patents. The Scot's conception of facsimile transmission was the basic principle of that in use to-day. He too, "scanned," but a century ago the method was crude. He envisaged a swinging pendulum in the transmitter, which would carry an electric current. Beneath it would be a metal plate on which the message or picture to be transmitted would be recorded in a paint or ink that was non-conducting. As the pendulum swung across the surface of metal, there would be greater or less variations in the current and these would constitute impulses transmitted by wire to the receiver, also of pendulum pattern.

Part of an advertisement transmitted by the Hogan system at 2 in. a minute

Loyal republicans are said to have occupied the police station and many Communists were reported shot.

The messages indicated it was expected the revolt would be supressed completely today.

Section of the "Radio Bee," a facsimile news-sheet

Development in the United States, at least, has been somewhat delayed by public and technical interest in television. To-day, with television well on its way, facsimile transmisssion is being developed rapidly. One of the obstacles to immediate commercial application with receivers in the hands of the public is the need for low-cost synchronisers that are, at the same time, efficient and do not slow down transmission. Certain of the synchronisers being used necessitate low speed. The transmissions to the *Tuscaloosa* were, for example, received at three feet an hour, although the Finch system can deliver facsimile at a maximum of nine feet an hour. Both radio and wire photographs are being sent across the Atlantic at the present time. As an indication of future possibilities consider the dissemination of news from one city to another by transmitting entire printed pages with illustrations, which would be multiplied by photo-offset printing and could be sold on the streets within two hours after being sent. While this plan envisages the use of wired rather than wireless transmission, technicians engaged in facsimile development suggest that their own experiments have indicated that wired facsimile may be less certain than wireless, except in certain sections.

The International Business Machines Co. is a participant in the patents taken out by the late Captain Otho Fulton for a facsimile system, the I.B.M. interest covering transmission of business documents only. It is believed that accounting, in stores and factories, for example, could be speeded up and made more accurate by short-wave, low-power transmission of the actual documents involved.

Except for the Finch system, all receivers have been built on a limited production basis. In the case of the Finch system, the Crosley Co., radio manufacturers, constructed receivers on a semi-mass-production basis for attachment to a Crosley radio receiver. They were offered for sale to the public through department stores and radio dealers. Sales have been small, largely because of limited experimental transmissions.

Unlike the television receiver, though, facsimile apparatus can be built at low cost because it is comparatively simple. The cheapest television sets in the United States cost about £39, while it is believed that a standard facsimile receiver could be constructed to retail at £10. It is a new field of manufacture for the electrical equipment maker, and one likely to develop at any time on a large scale.

The Finch organisation has recently brought out mobile facsimile transmitters and receivers. Several police motor cars in Bergen County, New Jersey, just across the Hudson River from New York City, have been equipped with facsimile two-way units that can send and receive, alternately. A New York newspaper is experimenting with a motor car into which is built transmitter, receiver and a dark room. It has a tiny writing space and typewriter for the news man. This is being tested for use in coverage of big news events where time might be very important in getting pictures and news into print.

The mobile units (transmitters and receivers) measure about 12 by 12 in. and are 7½ in. high; they weigh only 25 lb. The electrical equipment may be for battery operation, supplied by the motor car, for standard 110 V AC or DC, or anything in between. In the case of police cars, broadcasting equipment is installed so that the transmission and reception will be by short wave. This is necessary, as the unit needs to be open for communications at any and all times. For news reporting and transmission of pictures from the scene of the event, however, tie-up with the nearest telephone line is considered more desirable.

The Finch Company has developed a method of using any telephone, which, strangely enough, has been approved by the telephone company, which has rigorous rules against any tampering with its lines or equipment. The unit is an inductive coupling and cable. With one end of the cable attached to the transmitting and receiving unit in the motor car or special truck, the other end of the cable is carried from the kerb into the nearest public or other telephone in a store or home. The inductive coupling is a large, adjustable clamp that is fitted firmly on the telephone box. The user then calls the telephone operator and says, "Do not interrupt, this wire is being used for a facsimile transmission." The use is thereafter charged at the ordinary telephone rate of 2½d. for each three minutes, if a local call, or higher rates for longer distances. During the transmission of news and pictures in this way, it is not necessary to use the telephone as the office of reception can transmit messages of instruction back to the truck transmitter by writing them and having them scanned on its own transmitting drum.

Possible Military Uses

From this, the impression should not be gained that news coverage by this method is in actual daily use. It has been made possible and is being tested as a possibility for newspaper staff equipment. Similar testing of facsimile is being done by the United States Army, and the Navy is understood to be increasingly interested in possible use of facsimile for intercommunication between naval ships and for messages to and from bases. Facsimile can be employed to completely scramble coded messages, using both a code for the message itself and a transmission code based on speed and frequency.

The fact that facsimile can be transmitted with the greatest simplicity over standard telephone wires has suggested an ultimate use for it in the home for receipt of news, pictures or even fiction stories with illustrations. The equipment is far less expensive than television units. Where the lowest priced television receiver in the United States to-day is about £45 to £50, it is suggested that a facsimile receiver for telephone attachment by an inductive coupling could be furnished for £12 or less.

INSTITUTION PROCEEDINGS

E.R.A. Report on Fire-fighting Equipment. Industrial Uses of X-rays

Extinguishing Electrical Fires

FIRE-FIGHTING equipment for electrical installations is to be discussed at a meeting of the Institution of Electrical Engineers in London on January 25th.

The debate will be based on a report (V/T8) of the British Electrical and Allied Industries Research Association, which has divided the risks into four categories: (1) transformer banks, (*a*) exposed to the atmosphere and (*b*) in buildings; (2) cables, (*c*) in tunnels and ducts, and (*d*) runs or ducts exposed to the atmosphere.

This report describes tests that have been carried out and the equipment designed and erected for this purpose. The extinguishing media employed were inert gases (methyl-bromide and carbon dioxide), mechanical and chemical foam and water, which were applied in accordance with various manufacturers' conceptions. All collaborating firms were given a free hand with regard to their installation details and the quantities and compositions of media used. Exact records are detailed in E.R.A. report V/T7. The County of London Electric Supply Co., Ltd., provided facilities which made tests possible on a large scale and various fire brigades assisted.

Test results have been tabulated and the general recommendations emerging therefrom are that for outdoor oil risks (transformer banks, &c., exposed to the atmosphere) the most suitable extinguisher is atomised water. If this cannot easily be employed, then foam can be used; if neither can be utilised, inert gas may be applied if suitable barriers and screens are installed to prevent dispersion of gas due to atmospheric conditions and if a sufficiently large quantity of gas is provided. Where other forms of media are available gas protection is not recommended for this type of risk.

Regarding indoor oil risks (transformers, &c., in buildings) where weatherproof metal-clad gear is installed atomised water will provide adequate protection. Subject to reasonable protection from draughts, gas protection is adequate and has the advantage of leaving no trace and of being immune from risk of damage to other apparatus. Adequate protection can be obtained with foam but it has the disadvantage of leaving deposits which may hinder repair operations.

For cables in enclosed spaces not liable to draughts inert-gas protection is effective under conditions of rapid operation. Delay in operation may result in sufficient evolution of heat to cause smouldering, with attendant risk of re-ignition. Water and foam are subject to the same limitations and applications as relate to indoor oil risks, but in the case of tunnels drainage and cleaning problems may give rise to greater difficulties.

If there is no danger of brisk through-ventilation, and provided care is taken to supply gas in sufficient quantity to counteract dispersion, the remarks made above in connection with cable tunnels apply to cable galleries. Where brisk through-ventilation may occur and cannot be automatically checked, gas protection cannot be relied upon as the only line of defence, and unless chosen by weight of other considerations should not be used. In such cases water or foam installations will afford adequate protection.

Portable Appliances

The most suitable type of medium for portable appliances follows the same general lines as for fixed installations. However, on account of their conductivity foam and soda-acid solutions should never be used on live apparatus owing to the danger to the operators.

During the tests no opportunity arose for using carbon-tetrachloride extinguishers. Great care should be taken in using carbon-tetrachloride, carbon-dioxide, or methyl-bromide extinguishers in confined spaces, on account of risk to the health of the operator; thorough ventilation is necessary before the room is re-entered.

Whatever type of installation is installed, whether fixed or portable back-up water-hydrant protection should be provided in case of emergency.

The above conclusions apply to the fire-fighting aspect alone and do not attempt to take into consideration any aspects of risk of damage to electrical plant or the possibility of shut-downs due to temporary breakdown of insulation caused by the extinguishing agents used. Local conditions cover a wide range of factors, and upon this point each case should be considered on its merits. Whatever type of installation is provided, automatic or hand-operated, it is essential that adequate provision should be made for isolating electrical equipment affected by the fire as quickly as possible.

The time taken to extinguish free-burning materials during the tests suggests that water storage tanks should be equivalent to 4-5 min. supply and that water mains should be of sufficient bore to prevent excessive pressure-drop.

In no case should the running pressure fall below 50 lb. per sq. in. at the highest nozzle when all the nozzles are open.

Fixed installations of foam appliances must be carefully balanced in order to ensure that the foam supply is evenly distributed over the whole risk. This balance appears more critical than that for water, and unless precautions are taken one part of the installation may rob another of an adequate supply, thereby reducing the effectiveness of the installation as a whole.

Gas installations require careful design, and it is probably true to say that the success of this type of protection depends as much upon the installation itself as upon the medium used, if not even more so. During the tests carried out, methyl bromide was found to be quicker in action than CO_2. Owing to this fact it is authoritatively stated that there is no more risk to the health of the operator with methyl bromide than with CO_2 alone, and it is held that the medium which extinguishes the fire in the shortest time offers the least risk of injury to personnel.

Automatic operation may be made to depend upon detector heads of various types actuated by a rise of temperature. Complete reliance upon a single detector should not be tolerated, as this may cause considerable delay in operation for several reasons. Smoke detectors proved so fast in operation that it was found impossible to ignite a fire without bringing the detector into action. There are many situations in electrical installations where smoke detection could be given consideration with advantage.

X-rays in Industry

METHODS of utilising X-rays industrially were discussed in a long paper by Mr. H. P. Rooksby (G.E.C. Research Laboratories), which was read before the Royal Society of Arts in London on January 17th.

Examination which depends upon the penetrative power of the rays, aided by a fluorescent screen or photographic plate, was merely mentioned. Examples were the viewing of heating spirals embedded in cement in the boiling plates of domestic cookers, and the electrode systems of certain kinds of radio valves which were contained within a metal anode.

Most of the paper was concerned with the diffraction method of crystallography, which depends upon the reflection of X-rays by the regular arrangement of atoms in crystalline substances. Of the several available methods, the powdered crystal technique is the most generally used in industry for analytical purposes.

The author described the general procedure for the identification of chemical compounds, including the examination of quantities too small for chemical analysis and inclusions (in glass) which were difficult or impossible to separate by other means; also the methods of distinguishing between different crystalline forms of the same chemical compound; the formation of solid solutions and alloys; the crystal size, or state of subdivision, of a material; the presence of lattice distortion, and fibre structure. Incidentally, the author mentioned what he believed to be the first use of X-ray diffraction measurements for identification purposes in patent literature, namely, Specification 457,126, relating to a variety of fluorescent zinc silicate.

Many of the illustrations chosen emphasised how X-ray methods provided information which could not be obtained by chemical means. The complementary nature of the information given by X-ray, chemical and spectroscopic methods of examination was pointed out. For instance, in many metallurgical problems the results of microscopical examination could be amplified and elaborated by X-ray analysis. In assessing the quality of refractory materials X-ray tests took their place alongside measurements of porosity, thermal expansion, extension under load, and so on. One could also envisage the addition of new instruments to reveal yet further properties of materials, and the method of electron diffraction might be better suited to the examination of surface phenomena than X-ray analysis. On the other hand, it was not always realised how wide was the scope of X-ray analysis, and how certain physical properties, such as coefficient of expansion, which had

been measured in the classical manner had also been measured by X-ray methods. Such new measurements should not be regarded merely as repetitive, for new aspects of the physical property might be revealed by a fresh method of approach.

Finally, he mentioned the contribution that X-ray analysis was making to fundamental ideas of the structure of matter. New conceptions were arising directly out of the recent measurements on lattice distortion and the lower limiting size of crystallites developed in a cold worked metal, and the gradual clarification and development of the picture of the ultimate structure of matter owed much, and would owe still more in the future, to the revealing and searching power of X-rays. Changes in lattice dimensions of a few parts in ten thousand can be measured in this way, not only for purposes of identification but also for the determination of texture. The powdered crystal method usually has to be aided by other means when the precise atomic positions within a structure have to be revealed, but in industry less elaboration generally suffices for the recognition of a substance.

Reproduction of Sound

SOUND reproduction has not changed fundamentally since the introduction of thermionic valve amplifiers, but methods have been improved and applications have increased greatly. How they have done so was described in an illustrated lecture by Mr. D. T. Bennett (Film Industries, Ltd.) to the Association of Supervising Electrical Engineers in London on January 16th.

The merits and limitations of the five types of microphone most commonly used were explained, followed by a survey of the various classes of amplifier, the difference between "gain" and "output power" types being reiterated. Reference was made to the considerations which affect the choice of pentode, triode and the newer tetrode valves, and the manner in which inverse feed-back, or degeneration, was a method of reducing all three forms (amplitude, frequency and phase) of amplifier distortion was briefly mentioned.

Various kinds of loudspeaker were dealt with in a similar way, it being pointed out that for public address work or other uses involving the separation of the speaker and amplifier by a considerable distance the permanent-magnet type of speaker was usually to be preferred. After discussing the relative capabilities of horn and cone types, the lecturer turned to the important question of means of connecting the speakers to the amplifier, followed by descriptions of typical installations and related acoustic feed-back in large buildings as affected by the shape of the area to be covered.

The lecture concluded with a demonstration of a small piece of apparatus designed within the last two months for producing electrically without any moving parts a signal approximating to that of air-raid warning sirens for use in conjunction with existing loudspeaker systems.

Anthracite Colliery Power Plant

COLLIERY engineering in the anthracite coalfield was the subject dealt with by Mr. W. I. Tanner (Evans & Bevan, Ltd., of Neath) in a paper which he read to the South Wales branch of the Association of Mining Electrical Engineers at Cardiff on January 13th.

It was pointed out that the fact that the great majority of collieries produced most of their own power, and almost invariably from their own coal, created a distinction so far as the anthracite coalfield was concerned because anthracite smalls or duffs were extremely difficult to burn and so uneconomical to bring to the surface. Much was used for making patent fuels by compressing with a pitch or bitumen binder into bricks or ovoids which found a market when ruling prices were high, but meanwhile anthracite colliery owners were obliged to use valuable sized coals for their own power production.

The successful burning of anthracite duffs in pulverised form demanded low ash and moisture contents, but permitted the installation of boilers of larger capacity than any so far installed for stoker firing. Anthracite, being mainly carbon, burned from the outside only. It did not swell, burst, or alter its form to any appreciable extent as most other fuels did. The lump or particle burned on that outside surface which was exposed for contact with the air, and in this form it presented the minimum of surface per unit of weight. It was therefore slow in burning compared with other coals, requiring a strong draught to accelerate combustion by floating the fuel in the gas stream. Once the particle came into the chilling zone of the boiler tubes ignition ceased and the particle of fuel passed out of the system unburnt. Reducing the size of the particle of fuel to the minimum before introducing it into the combustion zone was the secret of the success of fine grinding in pulverised fuel practice.

Correspondence

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Rectifier Nomenclature

IN his interesting letter published in the ELECTRICAL REVIEW of December 29th, Mr. Rissik touched upon a problem which has become acute ever since grid-controlled mercury-arc vessels have been introduced on a practical scale for the various types of current conversion. Since Mr. Rissik invited other views for a discussion on this subject, I take the liberty of submitting suggestions which, in some respects, differ slightly from his proposals. The suggestions are set out in the following classification:—

Convertors:—Rotary convertors; oscillatory convertors (*e.g.*, vibrator, and mercury-jet convertor); and static convertors.

The elements of a static convertor area unidirectional device plus a transformer.

Types of unidirectional devices are:—(1) Semi-conductors (*e.g.*, the so-called copper-oxide rectifier); (2) Vacuum valves; and (3) Arc-discharge devices=mutators (*e.g.*, mercury-pool-cathode vessel, hot-cathode vessel, Ignitron).

Types of static convertors are:—(1) Rectifier: conversion of AC to DC; (2) Invertor: conversion of DC to AC; and (3) Static frequency convertor: conversion of AC to AC. (A suggested abbreviation for frequency convertor is "fre-convertor").

Types of mutator convertors:—(1) (Mutator) rectifier; (2) (Mutator) invertor; and (3) (Mutator) frequency convertor [(mutator) fre-convertor].

The prefix "mutator" may be omitted if there is no doubt about the significance of the term in question. R. FEINBERG.

Manchester, *January 11th.*

"Nobody's Babies"

There is a determined attempt by the use of such words as "dictum," "days of freedom," &c., to misconstrue the attitude I have adopted. In order again to make the position perfectly clear it is as follows:—(1) The electricity employers have never in the slightest degree sought to restrict the freedom of choice of organisation (trade union) to which their employees may belong. (2) The choice of trade union having been made by the employees, the next step is for that trade union to seek representation on the National Joint Board and the National Joint Industrial Council.

Nothing could be more clear than the above. The alternative of some five or six hundred undertakers negotiating separately with a new organisation outside the conciliation machinery for the industry is out of the question. The remedy for any grievances which may exist is therefore obvious.

I do not intend to enter into discussions on the merits of any particular case, and with regard to the Stretford Electricity Board I content myself with stating that for twenty-one years that Board has been a member of the National Board and the National Council, and throughout this period there has not been a case where the Stretford Board has failed to carry out a recommendation of the National Board or the National Council. Apart from general recommendations, the Stretford Board has never failed to observe the District Board's or District Council's decisions on specific matters referred for determination. A. H. BANKS,

Employers' Industrial Adviser.

Manchester, *January 13th.*

Cable Tests at 350 kV

SUBSEQUENTLY to the stability tests carried out by the Dutch authorities last year at the K.E.M.A. laboratories at Arnhem, the whole of the Callender impregnated pressure cable concerned was lifted and re-installed in the grounds of the new K.E.M.A. high-voltage laboratory. The test was then continued at 350 kV through 104 heat cycles (2,300 hours) instead of at the 260 kV employed for the earlier test in which after 400 heat cycles (5,000 hours), with the power factor of the dielectric down to 0.25 per cent., it was shown that there was no risk of failure due to thermal instability or other cause.

The 350-kV test produced no deterioration in the dielectric and the cable loss angle test certificate after completion of both testing programmes and removal is said to be to all intents and purposes identical with that of February, 1937, for the cable when new.

The cable has a conductor area of 0.65 sq. in., a wall dielectric of 0.929 in. and an overall diameter of 3.46 in. During transport and installation it can be treated as a solid type of cable, special attention being required only to rigid supporting of the cable and joints during installation.

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

AT the meeting of the F.B.I. Grand Council on January 10th Mr. Peter Bennett, from the chair, moved the nomination of **Lord Dudley Gordon** as president for the coming year. Lord Dudley Gordon, who is ex-president of the British Engineers' Association, has served for a number of years on the Grand Council, and was a few months ago appointed deputy-president of the Federation. He is chairman of J. & E. Hall, Ltd., and represents the engineering industry on the Advisory Council of the Board of Trade.

Mr. A. Wynn, general manager of the Midland Electric Manufacturing Co., Ltd., has from January 1st been appointed joint managing director of the company in association with **Mr. W. L. Barber,** the founder. Mr. Wynn's service with the

Mr. A. Wynn

Mr. W. J. Barber

M.E.M. dates back to 1923, since when he has held the positions of production engineer, works superintendent and assistant general manager. **Mr. W. John Barber** has been appointed to the board of the company from January 1st, and will in future act as works director. He joined the company in 1935, and has latterly acted as works superintendent.

Capt. R. C. Petter, M.I.Mech.E., and **Mr. C. L. Hill** have been elected to the board of the Brush Electrical Engineering Co., Ltd. Capt. Petter is also a director of Associated British Engineering, Ltd., and Petters, Ltd., and Mr. Hill is a director of Associated British Engineering, Ltd., and Heenan & Froude, Ltd., and is managing director of Charles Hill & Sons, Ltd.

Mr. F. R. Perris, M.I.E.E., Brighton telephone area engineer, has been appointed telephone manager at the newly established Swansea Telephone House, and to mark his appointment the staff at Telephone House, Brighton, recently presented him with a wardrobe and a canteen of cutlery. The presentation was made by Mr. G. Edward, telephone manager.

Mr. F. Sumpter, mains assistant with the Willesden Borough Electricity Department, was presented with a chiming electric clock and an electric radiator on January 2nd, on his retirement after thirty-seven years' service with the Department.

Mr. J. H. Crossley, B.Sc., sales manager of Birmingham Electric Furnaces, Ltd., has just returned to England by air from South Africa, where he has made an extensive tour of industrial plants in the Union and Rhodesia. During the trip Mr. Crossley supervised the erection of the largest electric arc furnace yet installed in South Africa. This is one of the standard models in the range of "Birlec Lectromelt" furnaces, and has a capacity of 8 tons and a rating of 3,600 kVA. Another steel melting furnace of 2 tons capacity was started up, while orders for further furnaces were secured.

On account of the war the usual party for employees' children given by the Elliott Social Association (Elliott Bros. (London), Ltd.), was not held this year, but the Association decided that the children should be given, instead, presents equivalent in value to the usual party expenses. Two hundred and fifty toys, books, dolls, &c., were distributed among the employees and were much appreciated by the children, both at home and those evacuated. Every child between the ages of five and twelve received a present, and employees' brothers and sisters between those ages were also included in the scheme.

Mr. D. P. Besley, manager of the Acton branch of Brown Bros., Ltd., has been appointed commercial manager of Brown Brothers (Aircraft), Ltd., and **Mr. W. M. James** takes up the position thus vacated as from January 8th.

Mr. C. R. Webb, chief engineer to the Shanghai Power Co., who has recently returned to this country, has been appointed deputy borough electrical engineer at Hackney in succession to Mr. J. R. J. Bowden, who is due for retirement next month. Mr. Webb was for nine years with the Hastings Tramways, first as assistant engineer, and later as chief assistant engineer. After a period of three years' war service he joined the Western Electric Co. (now Standard Telephones & Cables, Ltd.), with whom he was for one year in control of cable-laying and repair contracts. He then joined the Shanghai Municipal Electricity Department as mains engineer, and four years later he became assistant distribution engineer with that undertaking. When the Shanghai undertaking was sold to the Shanghai Power Co. in 1928 he became assistant chief engineer to the company and was subsequently appointed chief engineer, a position which he has held for seven years.

Mr. C. M. Shaw, M.I.E.E., is retiring from the position of city electrical engineer at Worcester, but will continue in office until his successor has been appointed. Mr. Shaw received his education at the Middle Class School, Leeds, and Yorkshire College, and his first post was as assistant and shift engineer at Dewsbury, which he held from 1894 to 1897. In the latter year he was appointed mains engineer at Leeds, and in 1902 he became city electrical engineer at Wakefield, which position he held until 1905, when he took up his present post of city electrical engineer at Worcester.

Since he has been at Worcester the development of the undertaking has been rapid and the sales for 1938-39 totalled 35,712,000 kWh, as compared with only 932,000 kWh for the year in which he joined the undertaking. Many extensions of the plant at the power station have been carried out under his supervision, among the schemes being the reconstruction of three "Southampton" boilers using his patent water-tube walls, increasing the aggregate steaming capacity from 80,000 lb. to 160,000 lb. per hour. The area of supply of the undertaking has been considerably extended under his direction, and he was successful in negotiating terms for a bulk supply to Malvern. Under the Central Electricity Board's scheme for the Central England Area Worcester was not a selected station. Mr. Shaw, however, advised and carried through an appeal which resulted in Worcester being selected.

Mr. C. M. Shaw

Mr. Shaw was elected an Associate Member of the I.E.E. on the creation of that class, and in 1907 he became a Member. He is a Fellow of the Institute of Fuel and one of the city members on the Severn Fishery Board and the Severn Development Association. In the dual capacity as city development officer he has been responsible for the establishment of several large new industries in Worcester. He represents Worcester Corporation on the District Industrial Council, District Joint Board of Employers and Staff Members, and is a member of the C.E.B. Consultative Technical Committee for the Central England Area and of the E.D.A. Executive Committee for the Central England Area.

Mr. H. M. Curtis is retiring at the end of this month from the position of supervisor of the Post Office Telephone Sales Department, Blackburn area. He joined the former National Telephone Co. as an electrical engineer at Liverpool in 1894 and was transferred to Blackburn as sales representative in 1907, five years before the company was absorbed by the G.P.O. In 1924 he was appointed supervisor at Bolton, and in 1932 returned to Blackburn.

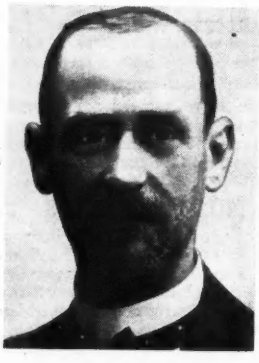
The Secretary of the Department of Scientific and Industrial Research announces that **Mr. C. H. Desch,** D.Sc., Ph.D., F.R.S., retired from the post of Superintendent of the Department of Metallurgy and Metallurgical Chemistry, National Physical Laboratory, on December 31st, 1939, having attained the age limit. Dr. Desch will be succeeded by **Mr. C. Sykes,** D.Sc., of the Metropolitan-Vickers Research Laboratories, who will take up his duties at Teddington on March 1st.

Lowestoft Corporation has arranged for **Mr. H. H. Saunders,** general manager of the electricity and transport undertakings, who will reach the retiring age of sixty-five in Arpil, to remain in office for another year.

Col. Sir W. Charles Wright has been appointed Controller of Iron and Steel in succession to Sir Andrew Duncan, who was recently appointed President of the Board of Trade. Sir Charles is chairman of Guest Keen Baldwins Iron & Steel Co., & Baldwins, Ltd., but ceased active participation in those companies when he became Deputy Controller of Iron & Steel on the outbreak of war.

Obituary

Mr. W. A. Heyes.—We regret to record the death of Mr. W. A. Heyes, chairman of Heyes & Co., Ltd., of Wigan. Mr. Heyes commenced his career in the electrical industry with the General Electric Co., Ltd., shortly after its formation, and he became actively interested in the application of electricity to mining. On the termination of his connection with the G.E.C. he became responsible for some of the earliest electrical installations in a number of collieries, and his many friends will remember him as one of the pioneers in this branch of the electrical industry. He made many notable contributions to the development of safer mining electrical equipment. He was a founder-member of the Association of Mining Electrical Engineers and a past-president of the North-Western Branch. He was also associated with many other technical bodies. The interment took place at Southport on January 8th.



The late Mr. W. A. Heyes

Mr. Alexander Davidson, M.I.E.E., who died on January 3rd, after a short illness, in his seventieth year, was a director of Creed & Co., Ltd., and of the International Marine Radio Co., Ltd., and European communications representative of the International Telephone & Telegraph Corporation. In 1896, after a period with the Anglo-American Telegraph Co., he joined the Central & South American Telegraph Co. (now All America Cables & Radio Inc.) as cable electrician, serving in the c.s. *Relay* and c.s *Guardian*, and was later made divisional superintendent at Lima, Peru. In 1917 he was appointed general manager in New York, and a year later became vice-president in charge of operations. Mr. Davidson returned to England in 1923 as vice-president of All America Cables, and was appointed European communications representative of the I.T. & T. Corporation in 1936.

Dr. A. G. Faulds.—A Scottish pioneer in the use of X-rays, Dr. Archibald Galbraith Faulds has died at Bearsden, near Glasgow, in his 80th year. He had the distinction of taking the first photograph by Röntgen rays in Scotland, and was associated with the late Dr. John McIntyre in pioneering work in connection with radiology.

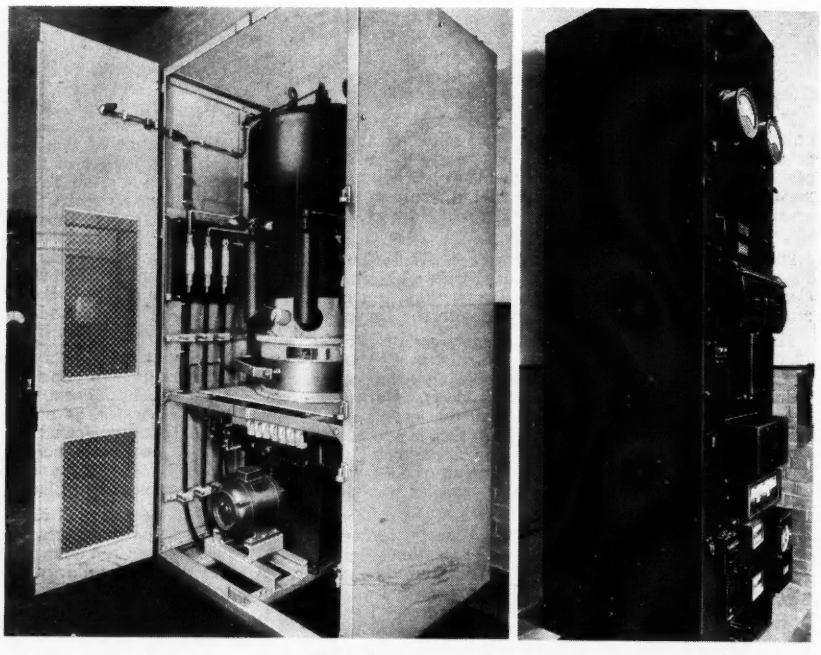
Sir Francis Goodenough.—The death occurred on January 11th, at the age of sixty-seven, of Sir Francis Goodenough, C.B.E., a leading figure in the gas industry, who joined the Gas Light & Coke Co., at the age of sixteen and remained in the service of that company through the whole of his business life, which lasted for forty-three years. Under his management the gas sales department was formed and he became controller. He was executive chairman of the British Commercial Gas Association from its formation in 1911 until his retirement in 1936, and among other offices held by him were the presidency of the British Export Society and joint honorary secretaryship of the National Gas Council. He was also prominently associated with the Institute of Export.

Mr. J. Judson.—We regret to record the death of Mr. John Judson, who died from pneumonia following influenza on January 4th, at his home, Nelson's House, Fulneck, Pudsey, Yorks. Mr. Judson, who was a recognised expert in everything pertaining to machine tools, was at one time a partner in the firm of Judson & Jackson, of Westminster, and during the last war acted as special correspondent for the *Daily Mail* on machine tool matters. In 1929 he joined George Cohen, Sons & Co., Ltd., and since 1933 had managed the company's machine tool department, with headquarters at Stanningley, near Leeds, and latterly he had, in addition, been doing important Government work in an honorary capacity.

Mr. Ernest James Riley, who was for many years secretary of the Leicester Corporation Electricity Department, has died at his home in Leicester after being ill for the past ten months.

Pumpless Air-cooled Rectifier

INCREASING traffic in one area of the Doncaster Corporation trolley-bus system has necessitated the installation of a further rectifier sub-station to augment the traction supply to two vehicle routes. The brick building, designed and erected by the Electricity Department's own staff, houses pumpless air-cooled rectifier equipment supplied by the General Electric Co., Ltd. A sheet-steel AC high-voltage switchgear cubicle with accessories controls the 11-kV incoming supply to the transformer, which is connected delta double three-phase and fitted with an off-load switch for tapping at + and − 3, 6 and 9 per cent. It is provided also with a tertiary winding, which gives 108 V for three-phase auxiliary supplies. An inter-phase transformer is mounted in the tank with the main transformer.



G.E.C. 300-kW pumpless air-cooled steel-clad rectifier, and cubicle equipped to control incoming 11-kV supply

The rectifier in a sheet-steel cubicle is rated at 300 kW, 572 A at 525 V, with overloads of 25 per cent. for two hours, 50 per cent. for 15 min. and 100 per cent. for 15 sec.

Cooling is effected by a motor-driven multi-vane fan, and other equipment within the cubicle includes the anode fuses, auxiliary isolating transformer, and auxiliary equipment panel. The G.E.C. vacuum seal is robust and of high dielectric strength.

No water supply or vacuum pumps are needed and glass is not used. The DC output switchboard consists of one rectifier and two feeder panels, each equipped with a single-pole line contact circuit-breaker of the electrically closed type, double-pole isolating switches and auxiliary items.

The rectifier is controlled by a time switch, by push-buttons and, in emergency, by hand operation. It is automatically ignited and excited and automatic closing of the DC breaker follows after a few seconds time delay. Before time switch tripping at the end of the known period of load demand, an auxiliary contact energises the trip coil of the DC circuit.

In an emergency the AC and DC breakers may be closed by hand, and the dual feeder push-button switches are of special design. The "close" button causes the feeder breaker to close directly and also mechanically releases a latch which holds the "trip" button in the depressed position; it is thus allowed to reset. The second operation breaks a contact in the breaker trip coil circuit and makes a contact in the reclosing relay coil circuit, the latter ensuring that the feeder is, in effect, selected and will close (and reclose a certain number of times after tripping on fault) whenever the busbars are alive. Hand operation of the feeder breakers is possible; should overload persist reclose relays will allow a predetermined number of reclosures only.

NEW ELECTRICAL PRODUCTS

A Review of Equipment Recently Marketed

A.R.P. Official Signs

A SERIES of illuminated signs conforming with BS/ARP/32 has been produced by the REVO ELECTRIC CO., LTD., Tipton, Staffs. Both externally and internally illuminated models are available, covering all requirements for location and direction indication.

The externally illuminated unit comprises a 12 in. by 24 in. vitreous enamelled steel plate with an additional full width screen shaped to give the specified cut-off. Incorporated in the screen is a specially designed lighting unit of heavy gauge steel, containing an optical device to control the amount of light emitted on to the face of the sign.

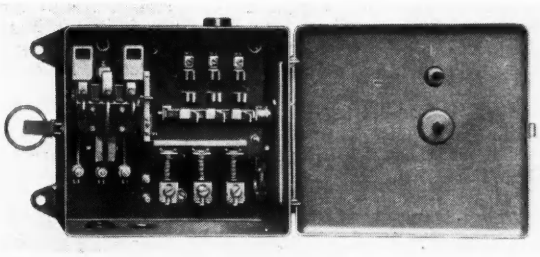
Revo internally illuminated sign

A removable weather-proof top is provided for the internally illuminated model which has a matt surface, internal baffle and reflector thus giving even illumination of the specified intensity over the entire face of the sign. Shatter-proof glass panels (one clear and one flashed) carry the letter stencil between them, provision being made for easy replacement of glass or stencils. Both models are designed for use with one 15-W lamp and both have black stove enamelled exteriors.

Direct-on Starter

A new 30-V direct-on starter introduced by the E.M.B. CO., LTD., Moor Street, West Bromwich, is a compact and robust unit, complying in every way with B.S.S. 587/1938. It has been built to give long service with little attention, and its triple-pole contactor is of the company's heavily rated type which is cool and silent in operation. The magnet is built up of high-permeability sheet-steel laminations, while the contacts are of large-section hard-drawn copper, shrouded by arc shields of refractory material designed to break high currents.

The starter is fitted with magnetic type overloads with oil dashpots to give the necessary time lag, the construction being based on the larger patterns which the company has found so successful. The dashpot is arranged to give reverse time lag. An isolating switch is enclosed in a separate compartment within the main case and is fitted with a steel cover plate. A mechanical interlock prevents the door being opened while the switch is on and the switch cannot be closed while the door is open. All interlock contacts are of solid silver. The case is of steel and although its size has been minimised this has been done without sacrificing cable space.



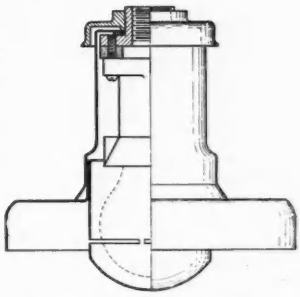
E.M.B. 30-A direct-on starter

Fuse Gear Development

When WILLIAM SANDERS & CO. (WEDNESBURY), LTD., Falcon Electrical Works, Wednesbury, Staffs, introduced their new "Duplex" fuses recently, they were not available in ratings less than 30 A 500 V because there was then no h.r.c. cartridge obtainable which was dimensionally smaller than that capacity. A smaller h.r.c. cartridge has since been developed which has enabled the company to bring out a fuse rated at 15 A 500 V. This completes the range, which now consists of 15, 30, 60, 10 and 200 A, 500 V sizes, with intermediate fuse cartridge ratings and a 15-A, 250-V range with the usual cartridge ratings up to that capacity. With the introduction of the new size, "Duplex" fuses will be incorporated as standard throughout the company's ironclad switch and fuse gear.

Street Lighting Unit

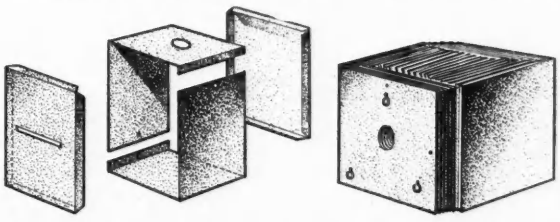
The "Ediswan" low intensity street lighting fitting produced by the EDISON SWAN ELECTRIC CO., LTD., 155, Charing Cross Road, London, W.C.2, to conform with BS/ARP/37 is a precision unit, with vitreous enamelled components designed expressly to maintain initial efficiency without constant maintenance. To this end, the use of wire gauze, finely pierced metal or glass reducing screens has been avoided, because such devices, acting as dust traps, are bound to show a continuous drop in efficiency from the time they are installed until they are cleaned, and to maintain any reasonable level of efficiency, cleaning would have to be frequent.



"Ediswan" street lighting fitting

The fitting contains two reflectors, constructed as a unit on the over-lamp principle, the light gap being masked to adjust light output according to mounting height. Each fitting is clearly marked to indicate the mounting height at which it should be fixed in conjunction with a 15-W pearl lamp. Incidentally, the reflector and cup forming the lower part of the fitting are so fixed that they can be quickly detached for lamp renewal and cleaning.

A die-cast and tapped top at the head of the fitting will, in many instances, make it possible to fix it directly into existing lanterns without the use of special adaptors. Where this is impracticable, a special adaptor is available.



Method of construction and packing of the Harcourt "Harco-windo" shop lighting fitting described last week

Cylindrical-type Cleaner

Attractive appearance, strength, efficiency and moderate price are combined in the new model "Q.101" vacuum cleaner of the cylindrical type introduced by VACTRIC, LTD., Honeypot Lane, Stanmore, Middlesex. The streamlined cream coloured body houses a ¼ HP, 10,500-RPM motor mounted on sponge rubber and suspended on springs, thus giving exceptionally quiet operation. The large-capacity dust-bag is easy to empty and incorporates an air purification filter. The method of wheel mounting gives excellent mobility, rubber buffers mounted on the wheel guards protecting furniture. A full set of accessories is provided.

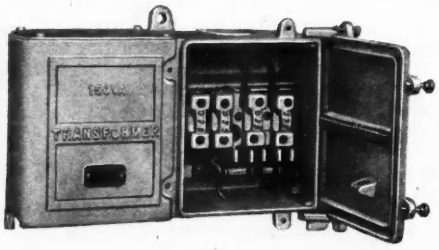
Vactric "Q.101" cleaner

Special Purpose Heaters

Since we described the new "Champion" heater in our last week's issue, we have heard from the manufacturers, BELLING & CO., LTD., Bridge Works, Enfield, that its popularity has decided them to introduce two larger models (1½ kW and 2¼ kW). Each has a very attractive lighting effect.

L.V. Switch-transformer Unit

To meet the demand for low-voltage lighting equipment for use in damp and exposed situations, such as boiler houses garages, dairies and breweries, and also on machine tools, as well as in A.R.P. shelters, a special combined switch-fuse and transformer unit has been manufactured by the GENERAL



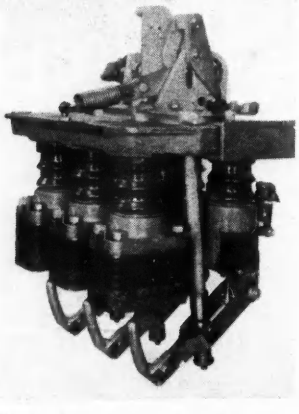
G.E.C. low-voltage switch-transformer unit

ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2. This unit is available for connection to single-phase, 50-cycle AC circuits at standard voltages and provides either a 12- or 25-V supply for low-voltage lighting fittings and portable hand-lamps. It consists of a 150-W transformer together with a main double-pole switch and fuses to protect the primary side and double-pole fuses on the secondary. The transformer is double wound, the centre-point of the secondary being earthed. The complete unit is housed in an iron-clad case, finished in silver colour and drilled for incoming and outgoing conduits.

A Rural Circuit-Breaker

The new "GPC" rural breaker of the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, 17, comprises a sheet-steel frame, incorporating hanger irons fitted with a detachable lid from which the circuit-breaker tank (containing 11½ gal. of oil) is hung by two lowering, raising and securing screws. The frame has a sloping shelf on each side, on which may be bolted a unit comprising three single-piece through-porcelain bushings or a three-phase cable box. Bolted to this frame on a three-point mounting is a malleable sub-frame carrying the complete circuit-breaker, mechanism and contact assemblies. Distortion of the outer housing cannot therefore affect alignment of breaker or mechanism.

The sub-frame carries six porcelain posts, on three of which cross-jet pots are mounted. The other three carry trip coil frames and hinge points, to which are pivoted the spring-loaded moving contact assemblies. In this way a balanced use is made of the space available, and the advantages associated with single-break cross-jet operation (hitherto confined to large power station circuit-breakers) are obtained, viz., quick interruption, short total arc length, minimum carbonisation, and confinement of the arc entirely to the cross-jet pots.



Bus-bar of the transformer-mounting Metrovick "GPC" circuit-breaker with lid removed and fitted with cable box

The breakers when tested at 11-kV to B.S.S. 116/1937 gave a total break time not exceeding three cycles from 10 to 100 per cent. rating. Of this time, one-half represented arc-duration. At lower currents, due to suction discs incorporated to prevent tripping on momentary overloads, the time became approximately five seconds at 130 per cent. of the normal setting.

The fixed contact is withdrawable from the side of the cross-jet pot by undoing only one bolt and without dismantling the jet assembly. The moving contact is located by grooves, enabling contracts to be changed with the minimum of adjustment.

Creepages and puncture distances are such that a complete breaker has withstood a one-minute, 50-cycle type test of 50 kV. The impulse level is over 140 kV with 1/50 positive waves, flash-over occurring externally. Auto-reclose and hand-close mechanisms are interchangeable. The weight-operated auto-reclose mechanism is cushioned by built-in compression springs. The complete breaker on its sub-frame can be removed by undoing the internal connections to the bushings and also the three-point securing bolts. Such accessories as auxiliary switches, shunt trips, definite minimum time delay trips, earth leakage trips and transformer mounting housings are available.

Installation Accessories

Several additions to their range of installation accessories have been made by J. H. TUCKER & CO., LTD., King's Road, Tyseley, Birmingham. By the introduction of non-rotating, one-section ring fixing in a new type of switch-plate the maintenance of correct vertical alignment is assured; a simple key formation integral with the moulded plate engages with the bridge of any type of the company's ring fixing flush switch.

A range of 1-in. deep 5-A iron boxes is made with rounded corners and no external projections. Spouts are provided with industrial sur-

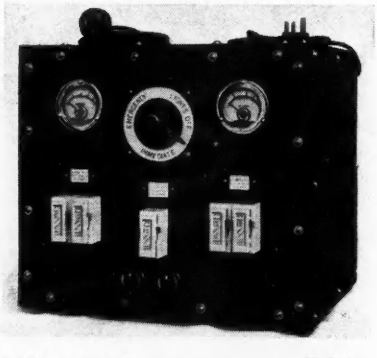
Tucker multi-section switch unit, and (below) a "small-base" switch

face types, but not with flush models. More room for wiring in a standard size box is obtained with the "small-base" AC "flash-proof" short-slow-break, quick-make flush switch, there being ⅜ in. more space in a 5-A switch and ¾ in. more room in a 15-A pattern. Special provision for adequate wiring space is also provided for in multi-section units which the company supplies in from 6 to 24 sections. These have movable grids and no obstructing pillars or projections to foul conductors.

Sockets and switch sockets are now available with "Tamper-proof" shutters, while the "Kwikwire" plug embodies non-rotating pins and cord-grip which are detachable for greater rapidity in wiring. Simplicity of design is the characteristic of the Tucker 7-10-A skelton switch produced to conform with B.S.S. 816. It has a one-piece frame and bridge to give maximum rigidity, and the dimensions permit its use in restricted space. Contact clips of extra long proportions give smooth, flexible pressure and maximum contact surfaces.

Emergency Lighting Equipment

The "Economic" emergency lighting equipment (six-light model) made by the SALISBURY TRANSFORMER & ELECTRICAL CO., LTD., 70a, Hamilton Road, Salisbury, is suitable for small cinemas, hotels, operating theatres, &c., as well as for A.R.P. purposes. The apparatus, which is fully automatic, is arranged to operate from AC mains and comprises a steel cabinet housing a charging unit, a transformer and an all-metal rectifier, together with the necessary control gear. A 12-V, 72-Ah battery is also supplied, with all the necessary lamps, lampholders, junction boxes, tables and flexibles.



Salisbury six-lamp emergency lighting equipment

On the failure of the main supply the emergency lights come into operation immediately and remain on until the main supply is restored, when the controlling device switches off the emergency lamps. Larger models are supplied in multiples of six lamps.

PERU'S ELECTRICAL IMPORTS

Figures Show a Rising Demand

THE following figures, taken from the Peruvian foreign trade returns, show the imports of electrical machinery and apparatus in 1938, with the leading countries of origin. A note of increases or decreases on 1937 has been added for purposes of comparison. Out of the total value of all such goods imported, namely, 10,813,000 soles, Germany accounted for 2,150,000 soles, the United States for 5,112,000 soles, and the United Kingdom for 845,000 soles.

The import trade in electrical machinery and apparatus as a whole was slightly above the high level of the previous year and five times that in 1932. It will be seen that a large decrease in dynamos and switchboards and telephone material and some minor declines in a few other items were offset by increases in the remainder of the list, notably material for lighting purposes. The leading supplying countries shared about equally in the increases, Italy being a good runner up. It is noteworthy that imports of machinery for a number of secondary industries increased by about 50 per cent.

The United States Department of Commerce has been drawing attention to this market which it describes as "certainly deserving of serious consideration by American exporters." The chief areas for electrical goods are Lima, Callao and several coastal towns. The American report attributes the success of Italian and Swiss competition to the fact that the major power-distributing company in the areas named is controlled by Italian capital and supervised by a Swiss engineer. On the other hand United States equipment is favoured by the important American-controlled mining enterprises.

In the American view prevailing conditions point to an accelerated demand for electrical equipment. In connection with Peru's manufacturing industries there has been an increasingly larger use of modern electrical plant, combined with demands for better and more widespread supply of electricity. In all centres of population that rank higher than a village an electric-lighting system is regarded as a prime necessity with the result that additional electrical supplies will in due course be needed, particularly as tariffs generally are not burdensome to those ordinarily in a position to employ electrical devices. Moreover potential sources of hydro-electric power are plentiful.

American prospects in the Peruvian market may be improved by the European war which is likely to prevent a number of countries from competing. On the other hand if the Allies purchase increasing quantities of Peruvian raw materials, there may well be reciprocal purchases. (£=between 20 and 24 soles in 1938.)

	1938 Soles (000)	Inc. or dec. on 1937 Soles (000)
Switches, circuit-breakers and similar accessories—		
Total	694	+ 194
From Germany	223	+ 23
„ United States	368	+ 138
„ United Kingdom	35	+ 20
„ Japan	13	− 4
Batteries, up to 30 kg. and parts—		
Total	434	+ 29
From Germany	36	+ 6
„ United States	328	+ 4
„ United Kingdom	32	+ 8
„ Japan	13	− 8
Batteries, over 30 kg.—		
Total	105	+ 23
From Germany	15	+ 11
„ United States	68	− 3
„ United Kingdom	19	+ 14
Insulators—		
Total	75	− 185
From United States	46	− 104
„ United Kingdom	9	− 5
„ Germany	15	− 65
Insulated covered wire and cable, up to 3 mm. diameter—		
Total	405	+ 109
From Germany	108	+ 55
„ United States	205	+ 131
„ United Kingdom	24	+ 12
„ Canada	24	− 53
Wire and cable, up to 3 mm., lead covered—		
Total	47	+ 35
From Germany	31	+ 21
„ United States	2	+ 1
„ United Kingdom	2	+ 2
„ Canada	3	+ 3
Copper wire, over 3 mm. diam., covered, etc.—		
Total	448	+ 68
From Germany	209	+ 120
„ United States	201	− 70
„ United Kingdom	11	+ 3
„ Italy	14	+ 13
Copper wire, over 3 mm., lead-covered—		
Total	113	+ 18
From Germany	81	− 2
„ United Kingdom	6	+ 6
„ United States	16	+ 11
„ Italy	10	+ 3

	1938 Soles (000)	Inc. or dec. on 1937 Soles (000)
Wire, insulated or uninsulated, lead-covered or armoured—		
Total	486	− 169
From Germany	27	− 203
„ United States	26	− 23
„ Italy	430	+ 80
Flex, covered with fabric—		
Total	60	+ 33
From Germany	32	+ 13
„ United States	14	+ 11
„ United Kingdom	3	+ 2
„ Japan	5	+ 3
Telephone cable, lead-covered—		
Total	242	− 279
From United Kingdom	208	− 187
Telephone apparatus—		
Total	300	− 40
From Belgium	170	− 60
„ Germany	24	− 2
„ United States	28	− 12
„ United Kingdom	46	+ 26
Radio apparatus—		
Total	2,156	− 34
From Germany	239	+ 9
„ United Kingdom	115	+ 75
„ United States	1,367	− 223
„ Holland	315	− 5
Radio valves—		
Total	122	+ 12
From United Kingdom	35	+ 11
„ Holland	14	+ 3
„ United States	70	− 2
Household heating apparatus, not over 10 kg.—		
Total	93	− 12
From Germany	41	− 3
„ United States	48	—
Heating apparatus, heavier, including industrial—		
Total	409	+ 8
From Germany	321	+ 112
„ United States	50	− 85
„ Switzerland	32	− 17
Vacuum cleaners, etc.—		
Total	61	− 8
From Germany	40	− 3
„ United States	18	− 1
Unspecified electrical goods—		
Total	254	+ 24
From United States	180	− 20
„ Germany	32	+ 3

	1938 Soles (000)	Inc. or dec. on 1937 Soles (000)
Lamps up to 50 W—		
Total	313	+ 33
From Germany	83	+ 3
„ United States	94	— 1
„ Holland	41	+ 7
„ Japan	43	+ 3
Lamps, over 50 and up to 200 W—		
Total	210	— 10
From Germany	41	— 9
„ United States	81	— 10
„ Holland	34	— 6
Lamps, over 200 W—		
Total	38	— 30
From United States	23	— 24
Meters, house—		
Total	102	+ 2
From Germany	53	+ 23
„ Canada	26	— 14
Electro-magnetic apparatus, medical—		
Total	276	+ 89
From United States	66	— 4
„ Germany	202	+ 102
Refrigerators—		
Total	529	+ 54
From United States	517	+ 57
Fractional h.p. motors—		
Total	73	— 3
From United States	61	+ 15
Dynamos and spare parts—		
Total	82	— 148
From Germany	29	— 21
„ United Kingdom	19	+ 17
„ United States	24	— 36
Switchboards—		
Total	536	— 584
From Germany	35	— 5
„ United States	106	+ 56
„ United Kingdom	79	+ 74
„ Belgium	275	— 465
Current transformers over 1 kW and rectifiers over 3 A—		
Total	964	+ 444
From Germany	66	+ 52
„ United States	397	+ 277
„ Switzerland	474	+ 134
Insulating tubes—		
Total	150	— 20
From Germany	8	— 8
„ United States	137	— 3
Ammeters, galvanometers, etc.—		
Total	156	+ 36
From United States	104	+ 14
„ United Kingdom	8	+ 3
„ Germany	34	+ 17
Fans—		
Total	32	+ 1
From United States	23	— 2

The Supply of Raw Materials

LAST week Col J. J. Llewellin, Parliamentary Secretary to the Ministry of Supply, gave some particulars of the activities of the Ministry of Supply in the control and distribution of raw materials. In the course of his remarks he said that the Empire was almost self-supporting; in many directions there had been considerable development since the last war. For instance, the production of copper ore had risen from 85,000 tons in 1914 to about 600,000 tons; lead ore from 130,000 to 630,000 tons; nickel from 20,000 to 95,000 tons; aluminium from 13,900 to 88,000; and asbestos from 98,000 to 344,000 tons.

Through the Ministry of Supply the State was a trader in a very large way, handling materials to the value of about £150 million a year. It was the owner of practically all the supplies of copper, aluminium and other non-ferrous metals, wool, flax, cotton and other commodities. Bulk purchase contracts had been made, largely with Empire countries. The whole of the exportable surplus of copper and zinc from Canada, Australia, Rhodesia and Burma and lead from Canada, Australia and Burma had been purchased at such prices that these materials were now sold at well below the world prices. The whole of the aluminium produced in Great Britain and large quantities of the Canadian and American supplies had been bought and steps had been taken to increase production here and in Canada. The home country's steel-making capacity had risen by 75 per cent since 1914 and India, Australia and South Africa were now producers. Empire steel production had increased from 9 million tons in 1914 to 18½ million tons.

Col. Llewellin summed up by saying that control of materials ensured equitable distribution at prices more stable and lower than would otherwise be the case. It also directed supplies into the most effective channels.

COMMERCIAL and INDUSTRIAL NEWS

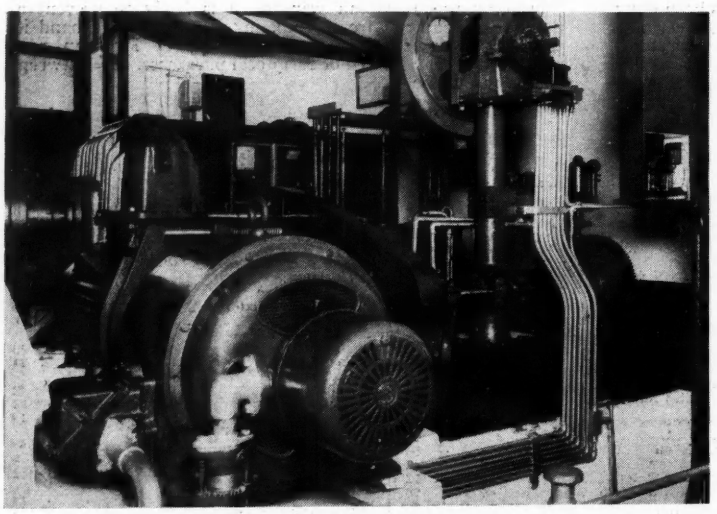
Bristol Electrical Equipment Pool. Finnish Electrical Trade. Torch Battery Prices. Lamp and Shade Fair. Rectifier Bulb Manufacture

Supply Industry Wages

At a meeting of the National Joint Industrial Council for the Electricity Supply Industry last month the question of a general formula to govern wages in the industry during the war was postponed for three months. An interim increase of ¾d. per hour on existing rates for all grades was granted. It was also decided that the wages of apprentices, probationers and juniors should be increased by an amount which would maintain the existing percentage relationship to the adult rate for the appropriate grade.

Electrical Equipment Pool

To prevent undue disorganisation of industry in the event of damage due to air raids, members of the electrical trade in Bristol discussed on January 3rd the forming of a pool of spare electrical equipment. At the conclusion of the meeting Col. Mark Whitwill, president of the Bristol Chamber of Commerce, said that the idea of forming a pool received full support, and it was decided to appoint a sub-committee to draw up a list of what spares were available. This follows a similar proposal contained in a letter from Col. S. E. Monkhouse, managing director of the North-Eastern Electric Supply Co., to the Tees-side Chamber of Commerce, reference to which was made in our issue of December 29th, 1939.



A 90-HP winding drum motor at the Gomersal Colliery

Electrical Trade in Finland

The war in Finland lends topical interest to the following notes received from a correspondent who recently paid a visit to that country. A special position is occupied in the internal economy of Finland by the various co-operative organisations, which handle among other commodities electrical, wireless and similar goods. Purchases for the whole of such stores throughout the country are centralised in the Hankkija organisation, whose head office in Helsinki is shown in the accompanying picture.

The business is divided into six main departments, those which are chiefly of interest to the electrical industry being (1) the cold storage department which supplies refrigerators, more especially to dairies, provision shops, restaurants, and hospitals, and (2) the electrical department, which plans and undertakes the construction of power stations and transmission lines, in addition to conducting a large trade in electrical machinery and fittings. Of recent years the electrical equipment of works, sanatoria, hospitals and public buildings has been the principal sphere of activity of this department, which also deals with telephone and wireless equipment. Sales of electrical requisites of all kinds have reached a record figure during the last few years, the increase in the sales of lamps having been particularly noteworthy. Installation business may be judged from the fact that during the last few years an average of seventy contracts have been undertaken per annum.

Some of the more important suppliers of machinery and equipment through the Hankkija organisation are the Swedish A.S.E.A. concern, Siemens, L. M. Ericsson Company and A/S Gram, of Denmark. Apart from the importing business undertaken in a number of lines, the Hankkija organisation possesses an engineering works at Malmo, devoted mainly to the production of certain types of agricultural machinery, particularly thrashers. Here also are manufactured "MKT" refrigerators, of which approximately 80 per annum are sold, apart from imported equipment.

Headquarters of the Hankkija organisation, Helsinki

Remote-controlled Electric Winder

In connection with an extensive programme of electrification at the Gomersal Colliery, an electric winding unit suitable for considerable future extension has been installed. The depth of shaft from bank to pit bottom is 129 yd. Weights are as follows: cage and chains, 11¼ cwt.; full tubs, 14 cwt.; ⅝-in. dia. rope, 455.4 lb. Times of wind and of decking are 20 and 10 sec. The drum is 8 ft. 3 in. in diameter and operates at 40 RPM. The rope has a safe working load of 4.5 tons and a breaking stress of 27.1 tons.

Control of the winding engine is by a relay system operated from a console in the control room. The main motor is a standard 400-V, slip-ring, 90-HP, 1,000-RPM machine by Brook Motors, Ltd., as are the motors elsewhere in the installation. A liquid controller designed for continuous duty in the rotor circuit is operated by a 1-HP motor. It is cooled by means of a coil in its housing, through which water is circulated by a pump. Reversal is carried out by a three-phase 300-A airbreak contactor connected to the stator of the winding motor. A main post or drum brake and an automatic electromagnetic brake are fitted. The former is operated either by manual or remote control, and the latter in the event of overwind, excessive speed or overload. Speed reduction is through a Brown Radicon 25 to 1 reduction gear.

Two B.T.H. electro-hydraulic thrustors are interconnected with the braking and speed retarding system. These are automatically put into operation by the closing of a switch by the engineman on receiving a signal that men are being raised or lowered. The whole sequence of control is indicated on an illuminated panel in view of the engineman. Mr. J. H. Gill, managing director of Birkenshaw Collieries Co., Ltd., with the company's engineer, was responsible for the design and construction of the complete unit.

A.R.P. Shelter Lighting

A new specification has been issued by the British Standards Institution entitled "A Reduced Scheme for the Lighting of Shelters where AC Mains are available" (BS/ARP 26). The principal object of this specification is to provide for a lighting installation from the mains, together with a battery and associated equipment for emergency use, at an overall price of approximately 5s. per person accommodated in the shelter. An installation at about this cost but deriving the lighting entirely from batteries, with other batteries in reserve, is already provided for in Part 1 of BS/ARP 6, which was published some time ago, but up to the present there has been no standard scheme which would enable the supply to be derived

from the mains and at the same time provide for reserve and for a reasonable standard of quality at this low cost.

The new specification is applicable to shelters of any size, large or small, but the equipment is specified in terms of units for 50 persons, and the estimated cost of 5s. per person has been based on prices for a 50-person shelter. Incidentally, this figure does not include an allowance for the cost of bringing the main supply to the shelter. The lighting is at 12 V, derived from the mains through a transformer, or from a battery through a change-over switch. Four lighting points are to be provided for every 50 persons, these being wired as two sub-circuits. Normally both sub-circuits are supplied from the transformer, but under emergency conditions one of the sub-circuits can be switched over to the battery. Details are given of the wiring, lamps, switches, fuses, transformer, batteries and spares.

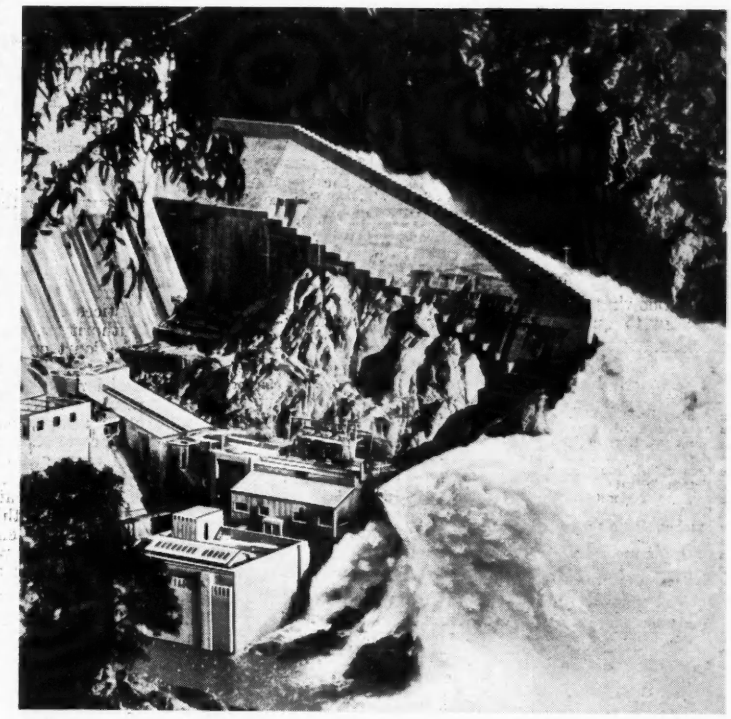
Copies of this BS/ARP Specification (No. 26) may be had from the British Standards Institution, 28, Victoria Street, S.W.1, price 3d. post free.

Pipe-line Discharge Regulator

A second pipe-line for the Burrinjuck Dam, N.S.W., recently ordered from the English Electric Co., Ltd., will incorporate a cylindrical balanced streamline diffusing discharge regulator, 7 ft. 6 in. in diameter. The valve will be a duplicate of that shown in the accompanying photograph which was installed in 1937. It was manufactured by the Clyde Engineering Co., Ltd., N.S.W., to English Electric designs. This discharge regulator, at the end of a 9-ft. diameter pipe-line traversing the dam, passes 3,000 cusecs under 165.25 ft. and 1,860 cusecs under 63.25 ft.

The valve consists of a cylinder bolted to the pipe-line flange and integral with a streamline diffusing cone at the centre, the two being joined together by ribs. The valve mouth comprises the annular space between the end of the cylinder and the cone, while the degree of opening is regulated by a sleeve sliding on the cylinder and its ribs. Another cylinder fitting round the piston completes the servo-motor for operation by the pipe-line water pressure.

The central cone of the valve causes a discharge in the shape of a hollow divergent cone, so that there is a maximum of air friction to absorb the power and the water breaks up into spray without damaging the foundations. The sliding surfaces of the valve are made rustless, which together with the simple and robust construction, ensures long life and negligible maintenance charges.



English Electric cylindrical balanced streamline diffusing discharge regulator

Torch Battery Prices

The question of excessive charges for torch batteries has been under consideration by the Central Price Regulation Committee, and recently the chairman, Mr. Raymond Evershed, K.C., made a statement in which he pointed out that most British-made batteries were marked with the retail price and should not be offered for sale at more than that price. Increases had been small and prices were as follows:—Large torch unit cell, 3½d. to 4d.; bijou battery (No. 8), 3d. to 3½d.; standard pocket lamp battery, 5d. to 6d., and cycle lamp battery, 8d. to 9d. The prices of other popular types remained unchanged. With regard to foreign batteries American-made large torch unit cells should be available at 6d. and American-made bijou batteries at 9d. each. The smaller foreign batteries might be considerably higher in price than corresponding British types.

Electrical Commercial Travellers

In view of the prevailing conditions the Electrical Trades' Commercial Travellers' Association has decided not to hold its annual dinner and its dinner-dance this year. In lieu of these two events arrangements have been made for a luncheon at the Connaught Rooms, Great Queen Street, London, W.C.2, on February 9th, at which Mr. P. E. Wheatland will take the chair. Tickets for the luncheon (7s. 6d. each) can be obtained from the secretary, Mr. S. Johnson, 78, The Ridgeway, Waddon, Surrey. Mr. T. W. Heather, a director of the General Electric Co., Ltd., is president of the Association, which, founded in 1925, now has a membership of 270. Since its inception it has contributed a total of £450 to the Electrical Industries' Benevolent Association, £400 to the Royal Commercial Travellers' Schools, and various sums to the Commercial Travellers' Benevolent Institution. In addition, members and friends of the Association have individually subscribed more than £1,000 to the first two mentioned charities.

Aluminium for Cable Sheathing

In the *A.E.G. Mitteilungen*, Messrs. A. Czempiel and C. Haase give particulars of some tests which have recently been carried out in Germany regarding the possibility of substituting aluminium for lead for the watertight sheathing of electric cables. The authors state that the tests have shown that 99.99 per cent. pure aluminium possesses mechanical properties equal to those of lead, and that the light metal can be compressed and handled at a temperature between 350 and 400 deg. C. in a press analogous to a lead press, producing aluminium sheaths which are not only watertight but show no breaks in the continuity of their structure.

Lamp and Shade Fair

A Lamp and Shade Fair will be held from February 19th to 23rd at Berners Hotel, London, W.1, under the auspices of the Lampshades and Standards Manufacturers' Association. The Fair is the first of its kind sponsored by the Association and it is receiving the support of leading manufacturers. Special hotel arrangements have been made for buyers visiting the Fair.

North-West Midlands J.E.A.

The Minister of Labour and National Service has given notice that after February 15th, 1940, he will designate to the North-West Midlands Joint Electricity Authority, in accordance with Section 2 (10) of Part I of the First Annex to the schedule to the North-West Midlands Electricity District Order, 1928, the employees' organisations having members in the employment of authorised undertakers in the district, in order that the organisations so designated may choose a representative of persons employed in connection with the supply of electricity in the District to be a member of the Joint Authority. Any employees' organisation desirous of being considered by the Minister for designation under the section should make application in writing to the Minister not later than February 8th, 1940, on the form provided for the purpose, of which copies may be obtained from the Secretary, Ministry of Labour and National Service, Montagu House, Whitehall, London, S.W.1.

Price Increase

The Airedale Electrical and Manufacturing Co., Ltd., Macta Works, Low Moor, Bradford, announces that owing to increased costs of basic metals, fuel, oil, &c., it is necessary to raise all current prices by a further 5 per cent. on and from February 1st, 1940.

Approved Lighting Fittings

Last week we reported that there had been some delay in the granting of approval to the various designs of low-intensity street lighting fittings which have been produced owing to the need for stringent tests, but that it was hoped to make supplies available in a very short while. Since then, up to the time of going to press, four manufacturers—the Revo Electric Co., Ltd., General Electric Co., Ltd., British Thomson-Houston Co., Ltd., and the Wardle Engineering Co., Ltd.—have been advised by the British Standards Institution that their fittings for 20ft. mounting height have now passed the tests and that a licence will be granted to commence manufacture immediately.

Practical Use of Fluorescence

A 28-page booklet entitled "The Practical Use of Fluorescence," published by Philips Lamps, Ltd., condenses a wealth of useful information into two parts, the first being devoted to technical data, describing what these radiations are, how they are produced, and the construction and operation of "Philora" MBW/V lamps, and the control gear which must be used with

them. In Part II actual applications of fluorescent materials are dealt with in a manner which will appeal both to the display expert and layman. A number of very useful hints and illustrations relate to display work for stores, cinemas and theatres, mass produced display units and exhibition work. A.R.P. authorities will also find a chapter in which a number of helpful suggestions are given. The uses of fluorescence in analysis work, chemistry, forensic science, philately, etc., are summarised, and prices of lamps and gear are given, as well as a list of suppliers of fluorescent materials. The booklet is available free from the company's "Philora" Department at Century House, Shaftesbury Avenue, W.C.2.

Wartime Cooking

"Electric Cooking Demonstrations in Wartime" is the title of some interesting notes produced by E.D.A. for the use of demonstrators. The information given deals with such matters as wartime cooking demonstrations and explanations of different food values. E.D.A. has also prepared "Economical Cookery—Wartime Recipes," a booklet of handy dimensions designed to help the housewife with some of her problems. It gives useful advice on the use of electric cookers, and contains many recipes and cooking hints.

Ensign Lamps

Ensign Lamps, Ltd., inform us that there has been no increase to the retail list prices of Ensign lamps and that the Ribble lamps remain available in the extended range of 25-60 W at 1s. each and 75 and 100 W at 1s. 6d., clear and pearl finish.

Sterling Cable Co., Ltd.

The business of the Sterling Cable Co., Ltd., is now a wholly owned subsidiary of A. C. Cossor, Ltd., and the board of directors has been strengthened by the inclusion of Sir Louis Sterling, Mr. T. A. Macauley and Mr. W. C. T. Cran.

Mr. Cran is an authority on broadcast relay service.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, ETC.	Price January 17th.	Fortnight's inc. or dec.
a	Acid oxalic ... ... per cwt.	Suspended	—
a	Ammoniac, Sal ... ... per ton		—
a	Ammonia, Muriate (large crystal)... ,,		—
a	Borax.. ... ... ,,		—
a	Copper, Sulphate ... ... ,,		—
a	Potash Chlorate ... ... per lb.		—
a	,, Perchlorate ... ... ,,		—
a	Shellac ... ... per cwt.		—
a	Sulphur, Commercial ... ... per ton		—
a	,, Roll ... ... ,,		—
a	Soda, Chlorate ... ... per lb.		—
a	,, Crystals ... ... per ton		—
a	Sodium. Bichromate, casks ... per lb.		—
	METALS, ETC.		
b	Aluminium, Ingots ... ... per ton	£110	—
b	,, Wire .... per lb.	1/3 to 1/9	—
b	,, Sheet and Foil ... ,,	1/6 to 2/9	—
p	Babbits Metal and Anti-friction Metals—		
	Grade I ... ... per ton net	£197	—
	Grade II ... ... ,,	£137	—
	Grade III ... ... ,,	£73	—
c	Brass (rolled metal 2" to 12" basis)... per lb.	9¾d.	—
c	,, Tubes (solid drawn) ... ... ,,	1/1¼ to 1/1½	—
c	,, Wire, bas's ... ... ,,	10½d.	—
c	Copper Tubes (solid drawn) ... ,,	1/2½	—
g	,, Bars (best selected) ... per ton	£95	—
g	,, Sheet... ... ... ,,		
g	,, Rod ... ... ,,		
d	,, (Electrolytic) Bars ... ... ,,	£62	—
d	,, ,, Wire Rods ... ,,	£65.10s.	—
d	,, ,, H.C. Wire ... per lb.	9⅝d.	—
f	Ebonite Rod ¼" dia. & up ... ... ,,	1/10to2/3 +10%	—
f	,, Sheet ⅛" thick & up ... ,,	1/4 to 1/8 adv.	—
n	German Silver Wire, Nos. 1 to 12... ,,	2/5	—
h	Gutta-percha, fine ... ... ,,	Nom.	—
h	India-rubber, Parafine ... ... ,,	1/1	—
g	Lead, English Pig ... ... ,,	£26.10s.	—
g	Mercury ... ... per bot.	Nom.	—
e	Mica (in original cases) small ... per lb.	1/3 to 3/-	—
e	,, ,, ,, medium ... ,,	9/- to 18/-	—
e	,, ,, ,, large ... ,,	20/- to 27/6	—
p	Phosphor Bronze, plain castings ... ,,	1/2½	—
p	,, ,, drawn bars & rods ,,	1/3¼	—
p	,, ,, rolled strip & sheet ,,	1/1½	—
p	,, ,, wire ... ... ,,	1/3½	—
o	Platinum ... ... per oz.	£10	—
d	Silicium Bronze Wire ... ... per lb.	8¾d.	—
g	Spelter ... ... per ton	£25.15s.	—
g	Tin, Block (English) ... ... ,,	£242.10s.	£3.15s. dec.
n	,, Wire, Nos. 1 to 16 ... ... per lb.	4/9	6d. inc.

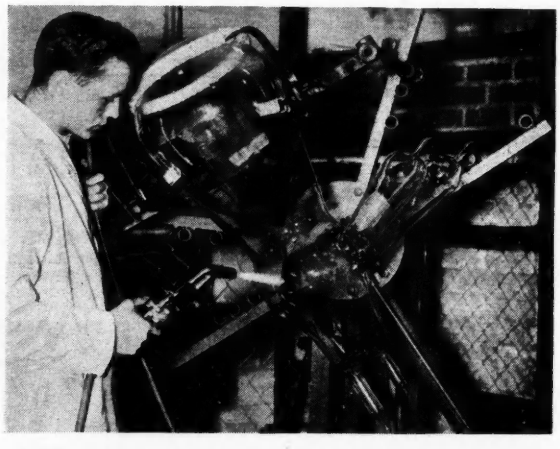
Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in this section under the same heading.

Making Rectifier Bulbs

A further stage in making their factory entirely self-contained has been reached by Nevelin Electric Co., Ltd., Purley Way, Croydon, which is now producing its own glassware for mercury arc rectifiers. This is a specialised process which, until recently, was carried out abroad. The body and "horns" or anode arms of the bulbs are made of cast "Phœnix" heat-



Assembling a 250-A, six-arm bulb at the Nevelin works

resisting glass, and the company has arranged its works to accommodate the special equipment required, which, incidentally, has been made by its own staff.

Rating of the Grid

On January 11th the hearing was commenced in a Divisional Court of King's Bench before the Lord Chief Justice and Justices Humphreys and Hilbery of the case Barking Rating Authority v. the Central Electricity Board, which came before the Court on a special case stated by Essex Quarter Sessions on the appeal by the Barking Rating Authority from the decision of Quarter Sessions with regard to the value for rating purposes of the Board's transformer sub-station and other things, including towers and lines attached to the Barking power station which was stated to be the largest in Europe and costing £164,000.

The queston of law to be decided was the proper method of assessing that part of the undertaking known as the grid which was within the area of the appellant rating authority, for the year ending April 5th, 1935, and whether Quarter Sessions were right in holding themselves bound in law to arrive at a rateable value on what was known as the profits basis (as the Board contended) or should have accepted the Rating Authority's submission that the rateable value should be calculated by applying the contractor's test of 5 per cent. on the capital value of the assets. That figure would yield a basis of £9,580.

Another question raised was whether Quarter Sessions were right in excluding evidence as to certain estimates and accounts of the Board for years subsequent to 1934. The Rating Authority contended that such evidence was admissible. Quarter Sessions, however, held that the rateable value on the profits basis for the year in question was nil.

Mr. Turner, K.C. (for Mr. Trustram Eve, K.C., who is on war service) and Mr. Scott Henderson, appeared for the appellants, and Mr. Craig Henderson, K.C. and Mr. Erskine Simes for the respondent Board.

On January 15th at the conclusion of the arguments the Court reserved judgment.

New Catalogues and Lists

Revo Electric Co., Ltd., Tipton Staffs.—An illustrated folder describing illuminated and non-illuminated A.R.P. official signs.

Runbaken Electrical Products, 13-15, Liverpool Road, Deansgate, Manchester.—Leaflets relating to a new self-feeding soldering iron and the new "Everbrite" rechargeable torch.

Belling Electric Co., Ltd., Bridge Works, Southbury Road, Enfield.—A leaflet giving particulars of the three "Champion" heaters now available.

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

We should be glad to have such information regarding the following:—

COXON micro projector.
DURMEG varnish.
NACOLITE sheet.
LITE-UP illuminated mirror.
CRONLITE torch.

ELECTRICITY SUPPLY

Competition at Bradford—Committee's Recommendations. Town Hall Heating at Leyton. Output in the West Midlands

Barnsley.—INSTALLATIONS IN COUNCIL HOUSES.—The Housing Committee recommends that no objection should be raised to tenants on the estate at Carlton making arrangements for the installation of electricity either with the Electricity Department or with the Electrical Distribution of Yorkshire, Ltd.

HOSPITAL COOKING EQUIPMENT.—A proposal is under consideration for the provision of electrical kitchen equipment at St. Helen's Hospital.

Barrow-in-Furness.—NEW SUB-STATION. — The Electricity Committee is to erect a sub-station on the Abbotsmead estate.

Blackpool.—SUB-STATION SWITCHGEAR.—The Electricity Department is to replace switchgear at the Corporation's substations at an estimated cost of £1,700.

Bradford.—COMPETITION BETWEEN UNDERTAKINGS.—Suggestions for overcoming the "wasteful and unsound" competition between the Corporation gas and electricity departments are contained in a report prepared by a Special Committee set up by the Corporation. The Committee which was formed last July to investigate possible economies in various branches of the Corporation, referring to the gas and electricity departments, speaks of a spirit of "violent competition" and no evidence of co-operation. As ratepayers are generally bound to use one or both of the services, such competition is considered unnecessary and to lead to wasteful and unsound practices.

The Special Committee recommends that the system of simple hire should cease, both undertakings having intimated that this system results in itself a loss. The two departments should be confined to the production of gas and the generation of electricity and the laying of mains and cables, a sales department should be set up to run as a joint concern which would effect sales without bias to either service, and no attempt should be made to persuade ratepayers to install uneconomic apparatus by officials of the departments or the receivers of commission. It is considered that publicity and showrooms costing £12,400 per annum are uncalled for and that this expenditure could be considerably reduced. The system of contractors persuading consumers to change the provided service should be discontinued and all applications for service should be made in writing to the sales department and no commission should be paid. Meter readers and inspectors should be trained to act for both departments. Greater care should be taken in examining job costs, particularly as to time taken and the number of men employed. The Finance (Estimates) Sub-Committee has the report under consideration.

Burnley.—RECORD OUTPUT.—Mr. J. E. Starkie, the borough electrical engineer, reports that despite the war the output of electricity last year constituted a record. The total number of kWh generated and purchased during the year showed an increase of 2,515,680, or 8.1 per cent., compared with 1938, although the maximum demand recorded decreased by 900 kW. Additional consumers numbering 1,151 brought the total number up to 27,982, and 80 per cent. of the premises in the area of supply are now connected to the Department's network.

Chichester.—SUB-STATION EXTENSION.—The Town Council is to extend the electricity sub-station in Westgate at an estimated cost of £1,905.

Hucknall.—ELECTRIC PUMPING.—The Urban District Council proposes to have an electric pumping set installed at the Salterford pumping station.

Leyton.—TOWN HALL HEATING.—An estimate of the cost of heating the Town Hall by electricity is to be submitted by the electrical engineer at the request of the Baths, Halls and Parks Committee. When the matter was discussed recently by the Council, Coun. Allanson contended that getting out the estimate would be waste of time as the cost would be prohibitive. Alderman Cochrane, however, said that the Hackney Council had installed a very fine system of electric heating at its new Town Hall, and Alderman Shimmin pointed out that for years they had been trying to get rid of smoke from the towns.

INCREASED CHARGES.—The Borough Council has made a 15 per cent. increase in its charges for electricity. For cookers on hire the charge has been raised from ¾d. to 1d. per kWh. The supply by prepayment meters will remain at 4½d. per kWh, but the practice of giving free lamps will be discontinued. Alderman Thorn stated that the consumption of electricity had fallen by 14 per cent. since the war started.

Lincoln.—NEGOTIATIONS FOR GRID TARIFF REDUCTION.—At the January meeting of the City Council the electrical engineer stated that owing to the termination of various loan charges on the undertaking the price of electricity, were the Lincoln station operating independently, would be less than the grid tariff charged by the Central Electricity Board, and he thought they were entitled to a reduction in the present charges. The engineer was instructed to carry out the necessary negotiations to ensure electricity being obtained at the lowest possible price.

EXTENSION SCHEME POSTPONED.—The Central Electricity Board is holding up indefinitely the extension scheme at St. Swithin's power station.

Nelson.—LOAN FOR APPARATUS.—The Town Council has decided to apply to the Electricity Commissioners for permission to borrow £15,000 for electrical apparatus for supplying to consumers on hire-purchase terms and simple hire.

10 PER CENT. PRICE INCREASE.—Increases in gas and electricity charges were approved by the Town Council last week. With regard to electricity, various tariffs are being advanced by 10 per cent. The rateable value tariff is altered to a fixed charge of 20 per cent. per annum, with a "unit" charge of ¾d.

Oadby (LEICS.).—ELECTRIFICATION OF SEWAGE WORKS.—The Urban District Council is to proceed with the electrification of the Council's sewage works, starting with the Stoughton Lane plant.

Sheffield.—MAINS EXTENSIONS.—The City Council has approved plans for mains extensions at an estimated cost of £20,687.

West Midlands.—LARGE INCREASE IN SALES.—An improvement during 1939 of over 30 per cent. in low-voltage sales in Shropshire (excluding the Shrewsbury undertaking acquired on October 1st, 1938) is reported by the West Midlands Joint Electricity Authority. In addition, high-voltage supplies to industrial concerns were up by 27 per cent. These figures relate to the Authority's distribution area. With regard to production at the J.E.A.'s power stations, it is estimated that during the present year the total output will be 930.2 million kWh compared with an actual production of 639.2 million kWh in 1939. The estimated cost of producing this output is £1,194,342; this includes £600,000 for coal, which is £269,000 more than on 1935 prices.

(*Continued on next page.*)

Modified Street Lighting

THE Bristol City Council has approved an expenditure of £20,000 for the provision of modified street lighting. About 17,000 lamp standards are involved and they will be put into service at the rate of 1,000 a week.

It was reported to the Light, Heat and Power Committee of the Salford City Council last week that the adaptation of the electric street lamps for the new lighting was virtually completed but that there had been a delay in the case of the gas lighting.

The Wareham Town Council is asking the Bournemouth and Poole Electricity Supply Co. to quote terms for the adaptation of the existing street lighting to conform with the new requirements.

Dorchester Town Council has decided not to proceed with a lighting scheme this winter but is to make inquiries into the matter before next winter.

The Tavistock Urban District Council has also deferred further consideration of the matter until it has received reports from larger areas regarding the efficacy of modified street lighting.

At Hungerford it was recently reported to the Urban District Council that the Wessex Electricity Co. had quoted 25s. per lamp for modified lighting. As the annual running cost would be 17s. 6d. it was thought that the scheme was not worth while and the Council consequently decided not to proceed with the proposal.

Crook and Willington and Bolton have decided to install the new form of street lighting. Having considered a report by Mr. N. Hunter, the electrical Engineer and manager on low-power street lighting, in which it was estimated that the cost of converting existing fittings would be about 17s. each, the Morley Street Lighting Committee has approved the provision of a system of modified lighting at Old Morley. Afterwards the conversion of the remaining lamps will be considered.

Bedford Lighting Committee reports that a scheme of modified street lighting will cost £1,500. It has decided to provide an experimental installation in Tavistock Street and Harpur Street.

Swansea Highways Committee is to try out a modified form of street lighting at a cost of £83.

Experiments are also being carried out at Coventry, Cannock and Doncaster.

Westminster City Council Lighting Committee has decided to complete a scheme for modified street lighting at a cost of £6,500.

West Hartlepool.—PROPOSED SUB-STATION.—Plans have been approved for a sub-station in Howbeck Lane for the Town Council.

Whitby.—LOANS.—The Urban District Council has decided to apply to the Electricity Commissioners for sanction to borrow £500 for domestic appliances; £1,000 for meters; £2,000 for mains and services; £2,000 for high-voltage switchgear; £360 for a sub-station building in St. Hilda's Terrace; and £6,000 for change-over in system of supply.

Overseas

France.—UNIFYING CONCESSION APPROVED.—The Ministry of Public Works has approved of a concession granted to the Société Yonne Lumière for distribution in the departments of the Yonne and the Aube. The concession constitutes a general authorisation to construct overhead and lay underground cables. Electricity will be provided partly by existing local plants and partly by connection to the French grid. The real purpose of the concession is to permit the Société Yonne Lumière to take over the smaller distributors now operating in the region so as to provide more unified and rational distribution. For the present, the voltages used in the various localities will be maintained.

RURAL ELECTRIFICATION TO PROCEED.—Provision is made in the French Budget for the continuation of rural electrification. The Minister of Agriculture has received an allocation of 50,000,000 fr. (maximum) for carrying out such projects, apart from which he is authorised to lend up to 75,000,000 fr. to rural communities as part of the cost of electrification work carried out by them.

Italy.—HIGH-FREQUENCY TRANSMISSION.—Faced with the problem of the economic transmission of large quantities of hydro-electric power from the north to the south of the peninsula Italian electrical circles are watching with great interest investigations in the use of high-frequency lines. For ordinary lines and the standard 50-cycle frequency the maximum distance over which power can be transmitted economically is said to be about 750 kilometres. Another possibility which is being considered is the use of DC transmission at high voltage, with AC produced at normal voltages which would be stepped up and rectified for transmission, being reconverted and stepped down for distribution. Both of these methods, Italian engineers are beginning to feel, may be superior to the present system which requires large conductors and introduces impedance into the lines unnecessarily.

INCREASE IN HYDRO-ELECTRIC POWER.—Information collected by the Unione Nazionale Fascista Industrie Elettriche indicates that important progress in the production of hydro-electric power has been made in Italy in recent years. In 1920 there were 276 hydro-electric plants of a total installed capacity of 933,500 kW and an annual production of 3,562 million kWh. By 1935 there were 1,010 plants, of an installed capacity of 4,330,394 kW and an annual production of 12,160 million kWh. During the same period the proportion of thermal energy in the total dropped from 27.4 to 18.8 per cent. Hydraulic production increased to 14,559 million kWh in 1938, and the estimated production during 1939 is 15,750 million kWh. Besides this, 80 hydro-electric plants now in construction will be completed by 1941, with an installed capacity of 950,000 kW.

Japan.—POWER SHORTAGE.—European buyers are seeking potassium chlorate from Japan, whose home-market demands leave little surplus for export, except to China and Manchukuo. Tempting prices are being offered to makers, who are reported to be hesitant on account of the inadequacy of supplies of power now available to the electrochemical industry. According to the *Chemical Trade Journal*, production may be undertaken by the Chosen Chisso Kagaku Kaisha, which company seems still to have in hand an unutilised portion of its power ration.

Yugoslavia.—NEW HYDRO-ELECTRIC STATION.—In a recent issue of the *Zeitschrift des Vereines Deutscher Ingenieure* details are given of a new hydro-electric station which has been completed on the River Treska to supply power to a number of factories near the town of Skoplje. The new plant comprises three 1,845-kW Francis vertical short-shaft turbines and alternators generating power at 6,000 V under a head varying between 57½ and 80 ft.

TRACTION

Brazil.—RAILWAY ELECTRIFICATION SCHEME.—A *Reuter* message from New York states that the American General Electric Co. and the Westinghouse Electric and Manufacturing Co. have organised a unit called the Electrical Export Corporation to handle the details in connection with an electrification project in Brazil. The undertaking is presumed to be the 304-mile Central Brazil Railway, of which less than one-third was completed by a British company some time ago.

Darwen.—DISCONTINUANCE OF TRAMWAYS.—The Corporation will probably have closed down all its tramway services by the end of March, the actual date of the completion of the change-over to buses depending on the delivery of ten new vehicles. It was originally thought that the war would hold up the scheme, for in September, through the shortage of petrol, trams were brought back on the Bolton Road section from which they were withdrawn in January, 1938. Darwen has had a tramway system since 1881. The Corporation took over in 1899 and electric cars first ran in 1900.

France.—PNEUMATIC TYRES ON ELECTRIC TRAINS.—The use of pneumatic tyres on the wheels of electric railway coaches, to provide cushioning between the rail and wheels, has been developed by Michelin & Co., of Clermont-Ferrand, France. The air pressure is about 9 kg. per sq. cm., and the tyre is mounted on a wheel rim of the type common to heavy road trucks. The rail flange curves downward from the wheel on the inner side of the tyre, of which it is not a part. It is lined with rubber to suppress the transmission of noise. A cushion inside each tyre prevents the wheel sinking more than a limited amount if air escapes from the tyre, the loss of pressure being indicated by signal lamps inside the driver's cabin. Such wheels can be replaced by spares as with motor-cars.

Pneumatic rail wheels are claimed to reduce noise, vibration, and shock, so lowering repair outlay on both rolling stock and track. They can be loaded to 1,200 kg., their life is up to 35,000 km., and defects average one in 1.5 million km. travelled.

There are 125 "Michelines" (rail coaches) in service; together they have already covered over 30 million km., and all are driven by petrol engines. The first electric train with pneumatic wheels has been equipped by the Compagnie Electro-Mécanique (Brown Boveri licensee for France), consisting of three coach bodies on four bogies, each bogie having four axles. There are two driving axles per bogie, with four motors totalling 652 HP at the wheel tread, or 572 kW at the one-hour rating. Multiple control is available from either end, DC at 650 V being collected from a third rail. The maximum speed is 120 km. per hour, and 256 passengers can be carried, of whom 180 are seated. Further details in the "Brown Boveri Review" include claims that the weight is about one-third of that of an ordinary train of the same capacity; that adhesion is greater, with less skidding, and that accelerating and braking efforts are larger. A "Micheline" is now under construction for 3,000 V DC, with six motors of 60 kW each. The three bodies will have one six-axle driving and two five-axle running bogies.

COMMUNICATIONS

Albania.—POWERFUL NEW WIRELESS STATION.—It was recently announced in Rome that a new radio station would soon be in operation at Tirana, chief town of Albania. The new station, it was claimed, would be the most powerful in the Balkans.—*Reuter*.

Eire.—TELEPHONE DEVELOPMENT.—A steady growth in the use of telephones last year is revealed in the annual report of the Department of Posts and Telegraphs. The number of local calls is estimated at 33 million, an increase of nearly two million over the previous year. Trunk calls, at 3,800,000, were up by 300,000. The number of telephones in use at the end of the year is given as approximately 44,000, or 3,000 more than a year before. On the other hand, fewer telegrams were sent, mainly due, it is thought, to the growing use of the telephone.

Great Britain.—TELEPHONE KIOSK LIGHTING.—The Hull Corporation Telephones Committee has arranged for the Electricity Department to install screened lighting in kiosks at a cost of £164.

SHILLING TRUNK CALLS.—The Postmaster-General announces that the cheap night trunk call rates suspended at the outbreak of war are to be reintroduced next month.

India.—MOBILE POST OFFICES.—Encouraged by the success of their first mobile post office, the Indian postal authorities intend to construct a number of similar vehicles for use in various parts of India. The mobile post office consists of a motor lorry with a specially constructed body fitted up as a post and telegraph office. It also has a telephone booth. Post offices on wheels are of particular value in India, where cattle shows, exhibitions, and pilgrim gatherings frequently take place at centres whose normal postal facilities cannot cope with the sudden temporary rush of traffic. The decision to build more of these vehicles has been prompted by the immediate success of the first experimental unit, which handled large numbers of letters, parcels, telegrams and telephone calls at the various centres which it visited.—*Reuter*.

I.M.E.A. Notes

THE headquarters of the Incorporated Municipal Electrical Association are again at Bush House, London, W.C.2, after a temporary removal to Leicester.

The Association's representative on the committee of the B.S.I. formed to consider the standardisation of clamps for connecting earth wires to water pipes is Mr. W. N. C. Clinch.

The following representatives have been appointed to the bodies specified:—*Local Advisory Committees of the National Register of Electrical Installation Contractors*.—Messrs. F. H. Pooles, F. Nicholls, G. A. Vowles, H. E. Blackiston, N. Boydell, N. R. Elliott, J. R. Jones, G. H. Dale and N. T. Smith. *Electrical Research Association*.—Messrs. R. Lee, F. Forrest and J. W. J. Townley. *Electrical Development Association*.—Messrs. F. Forrest, E. E. Hoadley, A. E. McKenzie, A. Nichols Moore and W. P. Lilwall.

NEW PATENTS

Electrical Specifications Recently Published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. *each*) *can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.*

1938

14721/14722. "Electron - discharge tubes." Hygrade Sylvania Corporation. May 28th, 1937/February 8th, 1938. (516110/516111.)

15102. "Alternating-current signalling systems." Standard Telephones & Cables, Ltd., and E. P. G. Wright. May 20th, 1938. (516114.)

17323. "Frequency-modulation systems." Standard Telephones & Cables, Ltd. July 9th, 1937. (515940.)

17530. "Electric circuit-interrupters with arc quenching by arc-generated gas." British Thomson-Houston Co., Ltd. June 29th, 1937. (515943.)

17613. "Cathode-ray tube arrangements." Baird Television, Ltd., and G. R. Tingley. June 14th, 1938. (515947.)

17674. "Arrangements for regulating the voltage supplied to a load circuit." Standard Telephones & Cables, Ltd., P. R. Thomas and R. Kelly. June 14th, 1938. (515948.)

17850. "Impulse senders, more particularly for use in telephone systems." Siemens & Halske Akt.-Ges. June 15th, 1937. (515952.)

17874. "Fittings for the fuse and meter connections of electric supply services." V. Hope. June 16th, 1938. (Cognate application 19781/39.) (515955.)

17935. "Electric salt-bath furnaces." L. Jessop. June 24th, 1937. (515960.)

17946. "Manufacture of electric lamps." Ever Ready Co. (Great Britain), Ltd., and E. F. Beeston. June 16th, 1938. (516004.)

17972. "Electrolytic production of zinc." I. G. Farbenindustrie Akt.-Ges. and D. Kupferhutte. June 21st, 1937. (Cognate applications 17973/38, 17974/38, 17975/38, 17976/38 and 17977/38.) (515962.)

18003. "Plug-and-socket connectors." J. B. Tucker. June 17th, 1938. (Cognate application 21192/38.) (516006.)

18015. "Tubular supports for electric lamps and the like." H. C. Cooper. June 17th, 1938. (516121.)

18021. "Electric switches of the tumbler type." R. Bain and N. Allday. June 17th, 1938. (Cognate application 33294/38.) (515966.)

18072. "Lanterns for electric lamps." British Thomson-Houston Co., Ltd., R. Maxton and J. Bertram. June 17th, 1938. (516012.)

18126. "Electric conductors." E. C. Cork and J. L. Pawsey. June 18th, 1938. (516063.)

18178. "Electric generators, particularly for internal combustion engine ignition." H. E. W. West and Rolls-Royce, Ltd. June 18th, 1938. (516123.)

18199. "Ultra-high-frequency systems." Marconi's Wireless Telegraph Co., Ltd. June 19th, 1937. (516067.)

18311. "High-frequency coils of variable inductance." Siemens & Halske Akt.-Ges. June 18th, 1937. (516080.)

18312. "Arrangements for measuring electric current of short wavelength." Siemens & Halske Akt.-Ges. June 19th, 1937. (516081)

18323 "Electric starting arrangements for internal-combustion engines." R. Bosch Ges. June 21st, 1937. (Cognate application 18324/38.) (516127.)

18346. "Electricity consumption meters." D. Z. de Ferranti and Ferranti, Ltd. June 21st, 1938. (516128.)

18490. "Electrical contact-spring operating equipment." Standard Telephones & Cables, Ltd., H. R. Stocks and E. A. H. Bowsher. June 21st, 1938. (516134.)

18421. "Battery-charging systems." Standard Telephones & Cables, Ltd., G. C. Hartley and E. A. Richards. June 21st, 1938. (516135.)

18422. "Electrical communication transmission systems." Standard Telephones & Cables, Ltd., and K. G. Hodgson. June 21st, 1938. (516136.)

18434. "Manufacture of electrode systems of unsymmetrical conductivity." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 24th, 1937. (516137.)

18451. "Electric systems for railway signal and point control." Vereinigte Eisenbahn-Signalwerke Ges. July 1st, 1937. (516138.)

18457. "Invertors for changing direct current to alternating current and including arc-discharge devices." Allgemeine Elektricitäts Ges. June 21st, 1937. (516140.)

18462. "Inductive heating at low frequency." A. F. Fekete. June 21st, 1938. (516142.)

18480. "Navigation-aiding radio transmitters." Marconi's Wireless Telegraph Co., Ltd., and B. J. Witt. June 21st, 1938. (516149.)

19915. "Electrical apparatus comprising at least one thermionic valve and adapted to operate at high frequencies." General Electric Co., Ltd., E. C. Cherry and G. W. Edwards. July 5th, 1938. (516152.)

20141. "Thermionic rectifier." M-O Valve Co., Ltd., W. H. Aldous and D. C. Espley. July 7th, 1938. (515982.)

20174. "Resinous compositions and articles made therefrom." British Thomson-Houston Co., Ltd. July 10th, 1937. (515985.)

20275. "Thermionic rectifiers feeding secondary emission electron multipliers." General Electric Co., Ltd., W. H. Aldous and D. C. Espley. July 8th, 1938 (516034.)

20309. "Measuring arrangements for high-frequency currents." Siemens & Halske Akt.-Ges. July 8th, 1937. (516036.)

20497. "Domestic laundry apparatus." A. H. Stevens (Electric Household Utilities Corporation). July 11th, 1938 (516041.)

20580. "Electric water-heater." D. H. Smith. July 12th, 1938. (516087.)

20663. "Secrecy signalling system." Standard Telephones & Cables, Ltd. August 11th, 1937. (516088.)

20759. "Electric ceiling switches." R. H. Baker and C. W. Parsons. July 13th, 1938 (Cognate application 35357/38.) (516154.)

21707. "Method of and apparatus for electrically precipitating suspended particles from gases." Lodge-Cottrell, Ltd. (International Precipitation Co., Inc.). July 21st, 1938. (516158.)

22151. "Fan-cooled dynamo-electric machines of the totally enclosed type." Harland Engineering Co., Ltd., and L. Greenwood. July 26th, 1938. (516161.)

33225. "Apparatus for the heat-treatment of materials." G. H. S. Grene and Wild-Barfield Electric Furnaces, Ltd. November 15th, 1938. (516102.)

33779. "Battery-cycle lamps." S. D. Sullam. November 21st, 1938. (515987.)

1939

2442. "Circuit arrangements for maintaining a constant terminal voltage across a load." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. January 27th, 1938. (516047.)

12638. "Domestic laundry apparatus." A. H. Stevens (Electric Household Utilities Corporation). July 11th, 1938. (Divided out of 516041.) (516052.)

17175. "Electron-discharge tubes." Hygrade Sylvania Corporation. February 8th, 1938. (Divided out of 516110 and 516111.) (516167.)

17176. "Electron-discharge tubes." F. B. Dehn. May 17th, 1938. (Divided out of 516110 and 516111.) Convention date not granted. (516168.)

17177. "Bases or caps for electron-discharge tubes." Hygrade Sylvania Corporation. May 28th, 1937. (Divided out of 516110 and 516111.) (Cognate application 17178/39. (516169.)

17890. "Supports for electric lamps and other electric fittings." H. C. Cooper. June 17th, 1938. (Divided out of 516121.) (516170.)

TRADE MARK APPLICATIONS

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from January 10th :—

Electricon. No. 606952. Class 9 (IV). Electrical apparatus for detecting, indicating and recording the presence of smoke or other solid particles in atmosphere or in effluent gases, and for automatically controlling electric circuits; photo-electric or thermionic measuring recording and controlling apparatus, electromagnetic relays, electric switches, alarms, contact devices, distribution boards and resistances and electricity meters.—British Electricon (London), Ltd., Grove House, 18, Old Town, Clapham, S.W.4.

Tuskite (lettering and design). No. 602822. Class 17 (IV). Tubes for insulating purposes made from paper treated with condensation products of phenol and formaldehyde.—Armand Taylor & Co., Ltd., Factory Yard, Uxbridge Road, Hanwell Broadway, W.7.

Testing Galvanised Wire

WHEN the British standard specification for the testing of the zinc coating on galvanised wires was issued in 1932 it was appreciated that copper sulphate dipping left much to be desired as a real criterion of the quality of the galvanising. The research work which has since been carried out in many countries is reflected in a new edition (No. 443) which has just been published.

The principal feature is the introduction of a test for the minimum weights of zinc per unit area on zinc-coated wires, in substitution for the copper sulphate test on straight wires, but the latter is retained for testing wires after being wrapped and unwrapped round a mandrel of specified diameter. Any advantages which the copper sulphate test may possess, such as the indication of the uniformity and concentricity of the coat, are therefore not lost in the new specification, but the specification itself is strengthened by the definition of the minimum weight of coat which the wire itself should carry.

The method of determining the weight of coat is the same as that recommended by the American Society for Testing Materials, the wire being stripped of the zinc coating by immersion in a solution of antimony chloride and hydrochloric acid. The minimum weight of coat is graded according to the diameter of the wire.

In an appendix some useful formulæ are given for calculating the percentage weight of the zinc coating. When tests of greater severity are required it is suggested that they should be additional to those of the B.S.S., copies of which (B.S. 443-1939) may be obtained from the British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 2d. post free.

FINANCIAL SECTION

New Companies. Returns of Capital. Debenture Charges. Bankruptcies and Liquidations. Reports of Electrical Companies. Dividend Announcements. Stocks and Shares

New Companies Registered

Silux, Ltd.—Private company. Registered January 10th. Capital, £1,000. Objects: To carry on the business of merchants, importers and exporters of and dealers in scientific, electric lighting equipment of all kinds, lighting fittings, incandescent lamps, component parts, glass and glassware, mirrors, reflectors, wire cable, switches and switchgear and apparatus, &c. Subscribers: A. J. Corbett, 35, Woodlands Road, Moseley, Birmingham; and H. C. Cousins, 139, Welford Road, Shirley, Warwickshire. Solicitors: Pinsent & Co., 6, Bennetts Hill, Birmingham.

Allsop Telephone Installing Co., Ltd.—Private company. Registered January 3rd. Capital, £100. Objects: To carry on the business of manufacturers and distributors of and/or wholesale and/or retail dealers in all kinds of electrical and radio appliances, electrical or radio engineers, wiring contractors, &c. Subscribers: R. I. Crawford, 23, Artesian Road, W.2; and H. W. Martin, 156, Ferme Park Road, N.8. Solicitor: Albin L. Hunt, 18, Bevis Marks, E.C.3.

Em-Vee Electric Co., Ltd.—Private company. Registered January 11th. Capital, £300. Objects: To carry on the business of dealers in electrical goods and fittings, manufacturers, wholesalers and retailers of lamps, shades, fires and all classes of electrical goods, furniture, cabinets, &c. Directors: M. Hertz and W. Hertz, both of 36, The Grampians, Western Gate, W.6. Registered office: 36, The Grampians, Western Gate, W.6.

Lighting & Heating (Stepney), Ltd.—Private company. Registered January 13th. Capital, £100. Objects: To carry on the business of electricians, mechanical engineers, manufacturers of and dealers in electricity, motive power and light, sellers of wireless apparatus, &c. Directors: L. Freeman, 18, Leweston Place, Stamford Hill, N.16, and R. Freeman, 18, Leweston Place, Stamford Hill, N.16. Registered office: 24, City Road, E.C.1.

Lion Stamping Co., Ltd.—Private company. Registered January 12th. Capital, £100. Objects: To carry on the business of electrical and general engineers, iron and brass founders, metallurgists, makers of and dealers in boilers, turbines, engines and general machinery, &c. Directors: G. W. F. Richards, 34, Craven Gardens, Barkingside, Essex, and S. L. Lesser, 52, Shaftesbury Avenue, W.1. Registered office: 52, Shaftesbury Avenue, W.1.

Ideal Hardening Co., Ltd.—Private company. Registered January 6th. Capital, £1,000. Objects: To carry on the business of heat treatment specialists, welders and workers in metals, &c. Directors: J. S. Fake, 50, Central Gardens, Central Road, Morden, Surrey, E. Steele, 8, Beeleigh Road, Morden, and J. C. G. Bainbridge, "Cyphers," Crofton Road, Orpington, Kent. Registered office: 3, Arlington Road, Surbiton, Surrey.

Companies' Returns

Statements of Capital

H.P. Electrical, Co., Ltd.—Capital, £1,000 in £1 shares. Return dated September 20th, 1939. 654 shares taken up. £654 paid. Mortgages and charges nil.

British Brown-Boveri, Ltd.—Capital, £50,000 in £5 shares. Return dated October 20th, 1939. All shares taken up. £21,250 paid (£2 10s. per share on 8,500 shares), £7,500 considered as paid on 1,500 shares (£5 per share). Mortgages and charges nil.

Simplex Electric Co., Ltd.—Capital, £500 in £1 shares. Return dated November 7th, 1939. All shares taken up. £500 paid. Mortgages and charges nil.

Bushing Co., Ltd.—Capital, £60,000 in £1 shares. Return dated November 24th, 1939. All shares taken up. £60,000 paid. Mortgages and charges nil.

Howard Smith (Electrical Engineers), Ltd.—Capital, £1,000 in £1 shares. Return dated November 29th, 1939. All shares taken up. £2 paid, £998 considered as paid. Mortgages and charges nil.

W. Skewes & Co., Ltd.—Satisfaction in full on December 8th, 1939, of mortgage dated October 4th, 1934, and registered October 17th, 1934. (According to the register of mortgages, the mortgage registered October 17th, 1934, originally secured £800.)

Walsall Electrical Co., Ltd. — The nominal capital has been increased by the addition of £1,000, in £1 ordinary shares, beyond the registered capital of £3,500.

Berkeley Electrical Engineering Co., Ltd.—Capital, £15,000 in £1 shares. Return dated October 2nd, 1939. 12,500 shares taken up. £12,500 paid. Mortgages and charges, nil.

Eco Power, Ltd.—Capital, £1,000 in £1 shares. Return dated October 11th, 1939. All shares taken up. £1,000 paid. Mortgages and charges, nil.

Tubes, Ltd.—Capital, £215,000 in £1 shares. Return dated November 14th, 1939. All shares taken up. £107,584 paid (£1 on 82,859 shares and 10s. on 49,450 shares). £107,416 considered as paid (£1 on 82,691 and 10s. on 49,450 shares). Mortgages and charges, nil.

Impex Electrical, Ltd. — Capital, £14,000 in £1 shares. Return dated November 17th, 1939. All shares taken up. £14,000 paid. Mortgages and charges, nil.

Electrical Equipment Co. (Leicester), Ltd.—Capital, £4,000 in 3,500 ordinary and 500 employees' preference shares of £1. Return dated November 24th, 1939. 3,250 ordinary shares taken up. £3,250 paid. Mortgages and charges, nil.

Perak River Hydro-Electric Power Co., Ltd.—Capital, £3,500,000 in 1,250,000 5 per cent. cumulative preference, 1,750,000 ordinary and 500,000 "A" shares of £1. Return dated November 22nd, 1939. 1,250,000 preference and 1,750,000 ordinary shares taken up. £808,041 paid on 400,000 preference and 408,041 ordinary shares. £2,191,959 considered as paid on 850,000 preference and 1,341,959 ordinary shares. Mortgages and charges, £864,200.

Mandaw Co., Ltd.—Capital £20,000 in £1 shares. Return dated November 22nd, 1939. All shares taken up. £20,000 paid. Mortgages and charges, nil.

R. A. Poole (London), Ltd.—Capital, £5,000 in £1 shares. Return dated October 12th, 1939. 2,500 shares taken up. £1,500 paid. £1,000 considered as paid. Mortgages and charges, nil.

Langleys (Kensal Rise), Ltd.—Capital, £2,500 in £1 shares. Return dated July 25th (filed December 7th), 1939. 2,054 shares taken up. £416 10s. paid (£1 on 4 and 5s. on 1,650 shares). £100 considered as paid (5s. on 400 shares). Mortgages and charges nil.

V. & G. Joyce, Ltd.—Capital £3,000 in £1 shares. Return dated October 23rd, 1939. 2,960 shares taken up. £2,960 paid. Mortgages and charges nil.

Mortgages and Charges

Insulating Materials, Ltd.—Satisfaction to the extent of £400 on March 30th, 1939, of debentures authorised June 14th, 1934, and registered July 24th, 1934. (Notice filed January 5th, 1940.)

Fisher, Humphries & Co., Ltd.—Satisfaction to the extent of £1,000 on November 24th, 1939, of second series of debentures authorised August 21st, 1939, and registered November 2nd, 1939. (According to the register of mortgages, the debentures registered November 2nd, 1939, originally secured not more than £8,000.)

Electrical Finance and Securities Co., Ltd.—Satisfaction to the extent of £5,966 on October 31st, 1939, of trust deeds dated July 29th, 1927, July 6th, 1928, April 24th, 1930, and January 29th, 1932, and registered July 29th, 1927, July 10th, 1928, April 29th, 1930, and February 1st, 1932, respectively. (Notice filed January 3rd, 1940.)

Power Specialities, Ltd.—Mortgage on land at Cippenham, Slough, Bucks, dated December 27th, 1939, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd., not exceeding £1,000.

Receivers Appointed and Released

Ismay Dirks Appliances, Ltd.—(a) H. H. Rose, of 190, Palmerston House, E.C.2, ceased to act as Receiver on January 2nd, 1940. (b) On the same date F. E. Langhelt, of Sterling Works, Dagenham, was appointed receiver under powers contained in debenture dated December 30th, 1937, in place of the said H. H. Rose.

Kniveton Cable Works, Ltd.—(a) H. H. Rose, of 190, Palmerston House, Old Broad Street, E.C., ceased to act as Receiver on January 4th, 1940. (b) On the same date F. E. Langhelt, of Sterling Works, Dagenham, was appointed Receiver under powers contained in debenture dated October 18th, 1938, in place of the said H. H. Rose.

Electrical Measuring Instruments, Ltd.—Chas. H. Culpen, of 41, Kings Road, Brighton, ceased to act as receiver and/or manager on July 27th, 1939. (Notice filed January 3rd, 1940.)

Increase of Capital

J. W. H. Simmons & Co., Ltd.—The nominal capital has been increased by the addition of £1,000, in £1 shares, beyond the registered capital of £1,000.

Small Electric Motors, Ltd. — The nominal capital has been increased by the addition of £10,000 beyond the registered capital of £10,000. The additional capital is divided into 10,000 redeemable 5½ per cent. preference shares of £1 each.

Agro Electrical Co., Ltd.—The nominal capital has been increased by the addition of £5,000, in £1 shares, beyond the registered capital of £500.

Bankruptcy Proceedings

T. W. Dennison, carrying on business under the style of T. W. Dennison & Co., 40, Thornton Road, Bradford, electrical and radio engineer.—The first meeting of creditors was held at the Official Receiver's Office, Hallfield Chambers, 71, Manningham Lane, Bradford, on January 10th, when a statement of affairs was submitted showing gross liabilities of £2,163 of which £1,890 was expected to rank for dividend, with assets of £134, leaving a deficiency of £1,756. The case being a summary one was left in the hands of the Official Receiver.

D. B. Jones, 1, Tireithin, Llwynhendy, Llanelly, electrical contractor. — This debtor's public examination was held on January 9th at the Guildhall, Carmarthen. His statement of affairs showed a deficiency of £155, and he said his failure was due to depression in trade and keen competition. The examination was closed.

H. Atterby, 11, Andrew Road, South Ferriby, Barton-on-Humber, Lincs, electrician, lately 1, Ash Tree Avenue, Great Grimsby, electrical contractor. — This debtor filed his own petition recently and according to the statement of affairs which has been lodged the gross liabilities amount to £834, of which £814 is expected to rank for dividend, with assets of £54, leaving a deficiency of £760.

W. N. Bishop, electrical engineer, 39, College Avenue, Maidenhead.—Public examination January 19th at the Town Hall, Windsor.

R. H. Olney (Radio Services), wireless dealer, 17, Marlowes, Hemel Hempstead.

(*Continued on page 85.*)

STOCKS AND SHARES

TUESDAY EVENING.

THE buoyancy which characterised Stock Exchange markets last week received an unpleasant shock through the developments which have occurred between Germany and the Low Countries. After being 97⅛, War Loan fell to 94¾ last Monday, rumour then maintaining that Germany was on the point of invading Holland. A recovery occurred to 96. These price fluctuations serve to illustrate the erratic course of markets as a whole.

The business activity which had been something of a feature, gave way to quieter conditions. Talk is revived of a possible requisitioning by the British Government of American securities held in this country, and registered at the Bank of England. Prices of Americans have gone back materially on the fear lest the British-held Americans will be sold for whatever they will realise in the New York Stock Exchange—a somewhat fantastic apprehension, it is safe to say.

Gilt-Edged Fluctuations

For a security ordinarily regarded as the world's most respectable investment, the War Loan is showing surprising liveliness. Starting the year at 93⅜, the quotation made haste to reach 97. Heavy profit-taking, and foreign developments, brought the price down to 94¾ before it ralllied, as just noted, to 96. This seems, for the moment, to be the point at which the profit takers and the new buyers about cancel each other out. The rest of the gilt-edged list has kept more or less in step. First and foremost, the strength of the market rests upon confidence in the national finances and the Government's cheap money policy. Another cogent if less inspiring explanation is the absence of other suitable avenues for money that is seeking a safe home. Investment abroad is, to all intents and purposes, banned. New issues of capital are under strict Government control. The industrial markets hold uncertainties and risks which, however small, are not overlooked by certain kinds of investment. The turn of the year released a volume of capital for employment in a market lacking floating supplies of stock. Finally, the position has tempted the speculator into activity. All of which factors have conspired to prepare an easy pitch for Mr. Chamberlain's "heavy-handed colleague" when he produces the next defence loans.

Electricity Supply Shares

In ordinary times, a rising gilt-edged market would be expected to carry electricity supply shares with it to some extent. These shares, because of their "gilt-edged" reputation among equity investments, are generally among the first to reflect the influence of gilt-edged sections in other parts of the Stock Exchange. On this occasion, electricity supply shares have shown indifference to the strength of the safety-first stocks, except in so far that prices have been firmly maintained since the completion of the process of adjustment to wartime conditions—or, rather, to the expectations of how those conditions will affect earnings and the dividends which are due to be declared, in the majority of cases, within the next two months. How quiet the market is at present can be judged from the fact that the only quotable change in our price-lists is a rise of $\frac{1}{16}$ to 30s. in Lancashire Electrics. The investment of £5,000 in the ordinary shares of a widely-spread list of provincial undertakings was accomplished a few days ago without causing a single alteration in prices other than that just mentioned.

Equities and Inflation

In the last war, inflationary elements were allowed liberal scope, and they developed in a manner which sent prices, and the cost of living, soaring. Such conditions struck hard at fixed incomes and the securities which provide them. Equities, or ordinary shares, in general, sometimes offered a way of partial escape, because in such circumstances company profits tend to follow the general upward direction. Despite an Excess Profits Tax of 80 per cent. and higher income-tax, many companies were left with an increased surplus of profits for distribution. Capital appreciation of a useful order followed in the most favoured groups of shares. On this present occasion, few people are counting on history repeating itself. They are in any case sufficiently sure of the prospect to indulge in switching their money on a large scale from gilt-edged into equity stocks. For which attitude the reason evidently lies in the Government's awareness of the dangers, and of a determination to avoid them, such as were expressed in the Prime Minister's recent speech at the Mansion House.

Equipment and Manufacturing Shares

Industrial markets have spent a quiet week, with food for thought in Mr. Chamberlain's stern reminder of further sacrifices to come. Little positive encouragement could be derived from the figures showing more unemployment now than there was in the month before the outbreak of the war. Nevertheless a firm front has been maintained, without, however, the occasional bursts of activity, in one section or another, which had been enlivening the proceedings in former weeks. An incipient revival in engineering shares proved to have little steam behind it, although the reports of high activity in that section of industry keep interest stirring. Among electrical equipment shares, Lancashire Dynamos have continued in good demand up to 57s. 6d., which represents a gain of half-a-crown over a fortnight. Henleys, too, are a good market at 18s. 9d. On the other hand, Lucas have taken a dull turn to 53s. 9d., while in the engineering and general group, Murex are back to £4, having lost the previous week's advance. Of the recently active shares, Ever Ready eased off to 26s. 6d. A few hundred of the company's 7 per cent. preference have come on offer at 36s. 3d. They participate up to 10 per cent., and are duly in receipt of the latter dividend. On this basis, the yield is 5¼ per cent. The shares do not usually enjoy a free market.

"Free of Stamp"

The North Metropolitan Power 3¼ per cent. second mortgage debenture stock which has been on offer for some time past in the Stock Exchange market is steadily diminishing in amount. As buyers have taken stock, so has the price been gradually raised until to-day the stock is not offered under 91¾ free of stamp. The issue price was 91¼.

It is generally known that transfers of registered stocks and shares are liable to a stamp duty of £1 per £100, and a company charges, as a rule, half-a-crown per deed for registration fee. In the case of a new issue, the stock often remains in scrip form until it is paid up in full, and is then transferable fully-paid in the company's books. This scrip, as such, passes from hand to hand without incurring liability for transfer stamp and fee. At a date duly notified by the company, the scrip must be registered into the name of the holder, and thereafter the stamp-duty is payable when the stock changes proprietorship.

The Effect Upon Yield

To illustrate by concrete example the effect of the stamp duty, it may be mentioned that on £100 of, say, a 5 per cent. stock costing £100, the addition of £1 2s. 6d. stamp and fee reduces the yield from 5 per cent. to £4 18s. 10d. per cent. Where considerable amounts of money are involved, the saving to be made by purchase of stamp-free stock is obvious.

Cases other than those brought about by new issues are occasionally to be found. For instance, a company may decide to raise capital by leaving stock "on tap" in the Stock Exchange market and transferring it to buyers without cost of stamp-duty to the latter.

Miscellaneous Matters

Electrical and Musical Industries shares failed to keep up the pace of their rapid recovery to 10s., and have slipped back to 8s. 3d. E. K. Coles lost a few pence to 4s. 6d. The home railway companies ended their financial years in December. No conclusion having been reached as yet in the negotiations to decide the Government compensation for the wartime use of the lines, the companies must still be in the dark over the amounts available for distribution in dividends. Consequently the possibility of a postponement of payments, at least on the border-line stocks, is causing some disappointment. The tone of the market is irregular. Tilling and British Automobile Traction have reduced the dividend from 9 to 8 per cent., being free of tax at a higher rate, the present distribution represents roughly the same gross payment as before. No change is marked in the stocks of British Electric Traction, but Tillings are 6d. lower at 38s. 3d. Among foreign traction issues, Brazilian Tractions are back to 9⅞ after their rise to 10¼. Cables and Wireless stocks reflect hopeful anticipation of the coming dividend. The preference, at 96¼, has again made the running, but the ordinary has been changing hands at well over 57. Oriental Telephones are better by $\frac{1}{16}$ at at 20⅜.

Vickers

While every energy is bent upon the task of winning the war, neither the Government nor the individual is unmindful of the need for making provision for the aftermath. The slump experiences that followed the 1918 peace are too painfully remembered for them not to be heeded as lessons in the next settlement. Vickers is evidently pursuing a cautious and far-sighted policy; the company's profits for the year ended December, 1938, showed an earnings yield of 12¾ per cent—a modest ratio when compared with those of various other engineering firms. It may fairly be surmised that Vickers has been engaged in the accumulation of reserves, the true value of which will become apparent when the time arrives to turn from guns to butter, from swords to ploughshares. The company is paying 10 per cent. on its 10s. ordinary shares and at the present price of 17s. 6d. the yield is £5 14s. per cent.

London Power Debenture

Four per cent. is a yield accepted readily enough by investors looking among first-class security debenture issues for a return rather better than is to be obtained from British Government stocks. In that section, yields are about 3⅝ per cent. on long-dated issues, and well under 3 per cent. where the capital is protected by a near redemption date. Stock of the kind in question becomes increasingly scarce. This serves as justification for calling attention to a line of London Power 4 per cent. redeemable debenture stock on offer at par, ex the interest paid on January 1st. The yield, of course, is 4 per cent. either flat or to redemption which may take place between 1952 and 1972. Wessex Electricity 3⅜ per cent. debentures, it may also be observed, can be bought at 97¼ to yield £3 17s. per cent. outright, or £3 19s. per cent. to redemption in 1959.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1939 Highest	1939 Lowest	Dividend Previous	Dividend Last	Price Jan. 16	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies							
Bournemouth and Poole	68/3	56/–	15	15	57/6	—	5 4 4
British Power and Light	30/9	21/–	7	7	26/–	—	5 7 8
City of London	33/9	22/–	7½	7½	26/6	—	5 13 2
Clyde Valley	38/6	26/9	8	8	33/3	—	4 16 3
County of London	46/9	28/–	10½	10½	35/–	—	6 0 0
Edmundson's :							
7% Pref.	31/6	27/6	7	7	27/6	—	5 1 10
Ord.	27/9	18/–	9	6	22/6	—	5 6 8
Elec. Dis. Yorkshire	41/6	32/–	9	9	35/9	—	5 0 5
Elec. Fin. and Securities	48/3	39/–	12½	12½	40/–	—	6 5 0
Elec. Supply Corporation	51/9	40/–	12	12	41/3	—	5 16 0
Isle of Thanet	20/–	15/–	4	4	15/–	—	5 6 8
Lancs Light and Power	34/6	25/–	7½	7½	30/–	+1/6	5 0 0
Llanelly Elec.	22/6	16/6	5½	5½	19/6	—	5 12 9
Lond. Assoc. Electric	30/–	18/–	7	7	19/6	—	7 3 7
London Electric	34/3	20/–	7	7	26/3	—	5 6 8
London Power Deb. Red.	106½	97	5	5	103½	—	4 16 6
Metropolitan	51/–	32/6	12	12	37/–	—	6 9 9
Midland Counties	39/6	30/–	8	8	33/9	—	4 14 9
Mid. Elec. Power	41/9	33/6	8	9	36/3	—	4 19 4
Newcastle Elec.	28/9	25/–	7	7	26/3	—	5 6 8
North Eastern Electric :							
Ordinary	32/3	23/6	7	7	27/–	—	5 3 8
7% Pref.	32/6	26/–	7	7	30/–	—	4 13 4
Northampton	48/–	41/–	10	10	42/6	—	4 15 0
Notting Hill 6% Pref. (£10)	13¼	10½	6	6	9½	—	—
Northmet Power :							
Ordinary	46/6	30/6	10	10	36/3	—	5 10 1
6% Pref.	29/–	23/6	6	6	27/–	—	4 9 0
Richmond Elec.	29/–	21/6	7	7	23/9	—	5 18 0
Scottish Power	38/9	27/6	8	8	32/6	—	4 18 6
Southern Areas	22/9	17/–	5	5	18/–	—	5 11 1
South London	30/9	22/–	7	7	22/–	—	6 7 3
West Devon	23/3	18/–	5	5	18/9	—	5 6 8
West Glos.	21/3	15/–	2	2½	16/3	—	3 1 6
Yorkshire Elec.	38/6	27/9	8	8	33/9	—	4 14 10
Overseas Electricity Companies							
Atlas Elec.	4/3	1/6	Nil	Nil	2/9	—	—
Calcutta Elec.	39/–	25/–	10*	10*	31/–	—	—
Cawnpore Elec.	34/6	27/3	10	10	28/9	—	—
East African Power	26/3	20/–	7	7	23/6	—	5 19 2
Jerusalem Elec.	24/6	21/–	7	7	21/6	—	6 10 4
Kalgoorlie (10/–)	10/6	9/–	7½	7	10/6	—	6 13 4
Madras	31/–	21/3	8*	8*	22/–	—	—
Montreal Power	35½	30	1½	1½	34	−½	—
Palestine Elec. "A"	27/3	19/6	7½*	5*	22/6	—	4 9 0
Perak Hydro-electric	19/6	12/6	6	2½	19/6	—	2 11 4
Shawinigan Power	25	20	85cts.	83cts.	25½	−1	—
Tokyo Elec 6%	63	33	6	6	65½	+2	9 0 6
Victoria Falls Power	73/9	60/–	12½	15	70/–	+½	4 5 9
Whitehall Investments Pref.	19/6	10/–	7½	7½	14/–	—	10 14 2
Public Boards							
Central Electricity :							
1950–70	112	103	5	5	107½	—	4 13 0
1955–75	115½	104½	5	5	109	+1	4 11 9
1951–73	106½	101	4	4½	103	—	4 7 3
1963–93	95½	84	3½	3½	91	—	3 18 7
London Elec. Trans. Gtd.	88½	83	2½	2½	89	—	2 16 2
London & Home Counties							
1955–75	107½	105	4½	4½	106½	—	4 4 6
Lond. Passenger Transport:							
A	114½	103	4½	4½	105½	—	4 5 2
B	117½	102	5	5	104½	—	4 15 7
C	83½	64½	4	1½	65	—	2 6 2
West Midland Joint Elec., 1948–68	112½	104½	5	5	106	—	4 14 4
Telegraph and Telephone							
American Tel. & Tel.	210	159	9	9	209½	+2	4 6 8
Anglo-Am. Tel. :							
Pref.	101¼	82	6	6	94½	—	6 7 0
Def.	23⅜	17	1½	1½	21½	—	6 19 6
Anglo-Portuguese	24/–	16/6	8	8	20/–	—	8 0 0
Cable & Wireless :							
5½% Pref.	97	75	4½	5½	96½	+1	5 14 2
Ord.	57½	35	4	4	56½	—	7 1 8
Income	100	85½	—	—	93½	—	4 5 7
Canadian Marconi $1	6/–	3/9	—	Nil	5/–	—	—
Globe Tel. & Tel. :							
Ord.	32/3	22/6	7½*	7½*	27/6	—	5 9 1
Pref.	26/9	20/–	6	6	25/–	—	4 16 0
Great Northern Tel. (£10)	38	18	20	20	20½	—	9 15 2
Inter. Tel. & Tel.	10½	5	Nil	Nil	5½	—	—
Marconi-Marine	30/–	23/–	7½	10	27/6	—	7 5 6
Oriental Telephone Ord.	2½	42/6	12*	12*	2⅜	+1/16	5 1 0
Radio Corpn.	8¾	5½	8	6	7½	—	—
Telephone Props.	14/–	12/9	5	6	13/9	—	8 14 6
Telephone Rentals (5/–)	10/–	6/3	10	10	8/3	—	6 1 3
Western Union	40½	19½	2¾	—	32½	—	—
Traction and Transport							
Anglo-Arg. Trams :							
First Pref. (£5)	7/6	3/6	Nil	Nil	5/–	—	—
4% Inc.	16	5	Nil	Nil	9	—	—
British Electric Traction :							
Def. Ord.	950	500	5	5	675	—	—
Pref. Ord.	164	115	8	8	155	—	5 3 4
Bristol Trams	52/6	35/–	8	10	42/6	—	4 14 1
Brazil Traction	13	6½	$1	50c.	9⅜	−⅜	—
Calcutta Trams	25/6	20/9	8	8	23/–	—	6 19 2
Cape Elec. Trams	18/–	16/9	5	5	17/–	—	5 17 8
Lancs Transport	37/9	27/6	10	10	30/–	—	6 13 4
Mexican Light :							
1st Bonds	35	20	5	5	35	—	—
Rio 5% Bonds	82	47	5	5	80	—	6 5 0
Southern Rly. :							
5% Prefd.	75½	48	5	5	65	—	7 13 10
5% Pref.	99½	79	5	5	93	—	5 7 6
T. Tilling	2½	32/6	10	10	38/3	−6d.	5 4 7
Tilling & B.A.	54/6	43/9	9*	8*	45/–	—	3 11 1
West Riding	37/9	30/–	10	10	28/9	—	—
Equipment and Manufacturing							
Aron Electricity Ord.	32/3	22/6	15	15	22/6	—	—
Assoc. Elec. :							
Ord.	45/3	30/–	10	10	38/3	—	5 4 9
Pref.	36/6	30/–	8	8	32/6	—	4 18 6
Automatic Telephone & El.	48/9	37/–	10	12½	42/6	—	5 17 8
Babcock & Wilcox	48/–	37/–	10	12½	42/6	−1/6	5 17 8
British Aluminium Ord.	61/3	48/–	12½	12½	50/–	—	5 0 0
British Insulated Ord.	88/–	70/3	20	20	78/9	—	5 0 0
British Thermostat (5/–)	16/–	11/6	18½	18½	12/6	—	7 8 0
British Vacuum Cleaner (5/-)	22/6	8/–	40	12½	10/–	—	6 5 0
Brush Ord.	5/9	2/6	Nil	Nil	4/–	—	—
Callender's	92/–	50/–	20	15	60/–	—	5 0 0
Chloride Elec. Storage	82/–	62/–	20	15	3½	—	4 5 9
Consolidated Signal	96/–	60/–	36½	36½	60/–	—	12 3 4
Crabtree (10/–)	25/6	16/6	17½	17½	21/3	—	8 4 9
Crompton Parkinson :							
Ord. (5/-)	21/–	12/6	15	20	17/6	—	5 14 3
E. K. Cole (5/–)	9/–	2/6	10	Nil	4/6	—	—
Elec. & Musical Industries (10/–)	14/9	6/6	5	Nil	8/3	−1/6	—
Electric Construction	40/6	28/–	12½	13½	33/9	—	8 0 0
Enfield Cable Ord.	58/–	37/6	25	16½	47/6	—	6 16 10
Electrical Switchgear (10/–)	27/–	23/–	16	10	21/3	—	4 14 3
English Electric	36/6	25/–	10	10	30/–	—	6 13 4
Ensign Lamps (5/–)	16/9	13/9	25	25	15/–	—	8 6 8
Ericsson Tel. (5/–)	43/–	32/3	25*	25*	35/–	—	3 11 5
Ever Ready (5/–)	26/6	16/9	35	30	26/6	—6d.	5 13 2
Falk Stadelmann	27/–	18/–	10	6	18/9	—	6 13 4
Ferranti Pref.	25/6	21/–	7	7	21/3	—	6 11 9
G.E.C. :							
Pref.	32/9	25/–	6½	6½	28/9	+1/16	4 10 6
Ord.	82/–	61/–	17½	20	75/–	—	5 4 4
Greenwood & Batley	29/–	20/–	7	15	22/6	—	13 6 8
Hall Telephone (10/–)	22/3	7/–	15	15	18/9	—	8 0 0
Henley's (5/–)	21/–	13/9	20	20	18/9	+1/16	5 16 8
4½% Pref.	23/–	18/–	4½	4½	18/9	—	4 16 0
Hopkinsons	46/9	37/–	12½	15	42/6	—	7 1 0
India-Rubber Pref.	22/–	17/9	5½	5½	20/–	—	5 10 0
Intl. Combustion	121/3	97/–	32½	32½	5½xd	—	5 18 0
J. Lucas	61/–	42/6	15	15	53/9½	—½	5 9 1
Johnson & Phillips	42/6	32/–	12½	12½	42/6	—	5 17 8
Lancashire Dynamo	72/–	50/–	25	25	57/6	+1/16	8 14 0
Laurence Scott (5/–)	12/–	8/6	15	15	9/6	—	7 18 4
London Elec. Wire	31/6	25/–	12	7½	26/3	—	5 14 4
Mather & Platt	50/3	37/6	13½	13½	44/6	—6d.	6 1 4
Metropolitan Elec. Cable Pf.	21/3	21/–	5½	5½	21,3	—	5 3 0
Murex	85/9	63/9	20	20	80/–	—½	5 0 0
Pye Deferred (5/–)	11/6	7/–	25	25	7/6	—	16 13 4
Revo (10/–)	35/6	22/–	17½	17½	21/3	—	8 4 9
Reyrolle	61/–	52/–	12½	12½	60/–	—	4 3 4
Siemens Ord.	26/9	17/–	7½	7½	20/–	—	7 10 0
Strand Elec. (5/–)	5/6	1/3	10	4	2/–	—	8 0 0
S. Smith (1/–)	9/6	5/6	37½	50	7/6	—	6 13 4
Switchgear & Cowans (5/–)	15/–	9/6	20	20	11/3	—	8 18 0
Telegraph Condenser (10/–)	7/6	5/–	5	—	7/6	—	—
Telegraph Construction	2½	27/6	10	10	32/6	—	6 3 1
Telephone Mfg. (5/–)	10/–	7/–	9	9	8/3	+3d.	5 9 1
Tube Investments	91/6	68/–	23½	23½	88/9	—9d.	5 8 0
Vactric (5/–)	4/3	2/–	4	Nil	2/6	—	—
Vickers (10/–)	24/6	14/6	10	10	17/6	—1/–	5 14 1
Ward & Goldstone (5/–)	22/6	19/6	20	20	19/9	—	5 1 3
Westinghouse Brake	54/9	38/–	17½	17½	2½	—	8 4 9
Walsall Conduits (4/–)	31/9	21/3	55	55	25/–	—	8 16 0
West, Allen (5/–)	7/6	5/–	7½	10	5/9	—	8 14 0

* Dividends are paid free of Income Tax.

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), Great George Street, London, S.W.1.

Australia.—MELBOURNE.—February 13th. State Electricity Commission of Victoria. Triple-braided copper aerial cable. (T. 15259/40.)*

April 2nd. Cable for three-phase 6.6-kV system. (T. 15010/40.)*

Birmingham.—February 9th. Electric Supply Department. Three electrically driven pumps. (January 12th.)

Cardiff.—February 5th. Electricity Department. E.h.v. sub-station switchgear and e.h.v. and l.v. paper insulated cables for one year. (January 12th.)

Dundee. — January 24th. Electricity Department. Electric lighting and heating installation, including insulated cable, main switches, distribution boards, tubular heaters, thermostats, &c., at the new switch house, Carolina Port generating station. Specifications, forms, &c., from D. H. Bishop, general manager and engineer, Dudhope Crescent Road. Tenders to town clerk.

Erith.—January 25th. Corporation. 150 electrically illuminated A.R.P. signs, and fittings to illuminate existing signs. J. H. Clayton, borough engineer, Council Offices. (Deposit, £1 1s.)

Gellygaer. — February 16th. U.D.C. Electrical apparatus and materials for one year. (See this issue.)

Iran.—TEHRAN.—March 1st. Ministry of Industry and Mines. Machinery for a cane sugar factory. (T. 23403/39.)*

Kettering.—February 5th. Electricity Department. Transformers. (See this issue.)

London. — BATTERSEA.—February 14th. Electricity Department. Electrical materials for one year from April 1st. (January 5th.)

KENSINGTON.—February 2nd. Borough Council. Electrical fittings (a) cables, flexibles, &c., and (b) conduits, fittings and accessories. F. Webster, town clerk, Town Hall, W.8.

Manchester.—February 1st. Electricity Committee. One 120-kW mercury-arc rectifier equipment. (See this issue.)

New Zealand. — WELLINGTON. — Public Works Department. February 13th. Three single-phase transformer units. (T. 28146/39.)* Two 2,250-kVA three-phase boosting transformers. (T. 28144/39.)* Remote control equipment. (T. 28791/39.)*

February 20th. Seven single-phase transformer units. (T. 28148/39.)* Four single-phase transformer units. (T. 28147/39.)*

February 27th. 22-kW switchgear. (T. 28858/39.)* 11-kV switchgear. (T. 28789/39.)*

February 13th. Cable and cable boxes. (T. 15292/40.)*

March 12th. 110-kV outdoor switchgear and steelwork. (T. 28145/39.)*

March 26th. Four single-phase transformer units. (T. 28143/39.)*

March 5th. Cables. (T. 30431/39.)*

March 19th. Switchgear and steelwork. (T. 30384/39.)*

April 2nd. Switchgear and steelwork. (T. 30385/39.)*

South Africa.—SALISBURY (S. RHODESIA).—April 15th. Municipality. Cables. (T. 30438/39.)*

February 5th. Insulators, stay wire and copper conductor. (T. 15120/40.)*

February 19th. L.v. and h.v. switchgear. (T.Y. 15306/40.)*

CAPE TOWN.—March 6th. Electricity Department. Two 500 kVA (or alternatively two 600 kVA) three-phase transformers and two 50 kVA transformers. (T. 15056/40.)*

Stoke-on-Trent.—February 14th. Electrical Engineer's Department. Mains and cables, high-voltage truck type sub-station switchgear, transformers and meters for one year. (See this issue.)

Sutton and Cheam. — January 26th. Electric lighting in public shelters, and constant potential battery charger, for Corporation; N. H. Mitchell, borough engineer, High Street, Sutton, Surrey (deposit £2 2s.).

Uxbridge.—January 31st. U.D.C. Electric lamps for one year. E. E. T. Bolton, engineer, 263, High Street.

Orders Placed

London. — ST. PANCRAS. — Electricity Committee. Accepted. Recalibration of prepayment meters (£320); Chamberlain & Hookham. Hurricane lamp screens (£72).—Hotpoint Electric Appliance Co.

Lowestoft. — Emergency Committee. Accepted. 6 doz. twin-cell type batteries and 25 electric handlamp bulbs.—Ever Ready (Great Britain), Ltd.

Smethwick.—Watch Committee. Accepted for fire service premises.—Electric lighting installation (£45) and fittings (£46).—S.W. & S. Elec. Power Co. Heating installation (£233).—Hope's Heating & Lighting, Ltd. Electricity installation at cleansing station (£27).—J. E. Hemming.

Worthing.—Electricity Committee. Accepted. Change-over lift conversion (£87).—Pickerings, Ltd.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alfreton.—Sunday school at South Normanton Zion Methodist Church (£2,000); J. W. Andrew Swanwick, contractor, Alfreton.

Ashington. — Temporary fire station, North Seaton Road, for the U.D.C.; surveyor.

Barnoldswick. — Laundry buildings, Gisburn Street; W. B. Barret & Son.

Barrow-in-Furness. — Extensions to North Lonsdale Hospital.

Batley.—Shops, Commercial Street; borough surveyor.

Bedfordshire.—Second section, Technical College, Luton, for E.C.; County Architects Department, Shire Hall, Bedford.

Billingham-on-Tees. — Conversion of The Hostel, Haverton Hill, into first-aid post and cleansing depôt; J. H. Hill, U.D.C. surveyor.

Blackpool.—Blocks of houses at Caton Grove, &c.; J. Drake, borough engineer, Municipal Buildings, Blackpool.

Bootle.—Alterations to corporation workshops, Linacre Lane; W. A. Harrison, borough engineer, Municipal Buildings, Oriel Road, Bootle, Liverpool.

Bournemouth.—Flats, Manor Road; L. S. Youngman.

Brighouse. — Three decontamination centres; borough surveyor.

Bristol.—Health centre with nursery accommodation, Lower Ashley Road, for T.C.; borough surveyor.

Completion of homes for the aged (£20,000); city engineer.

Completion of Filwood Park school (£59,000); city engineer.

Bromley.—Extensions, Raglan Road school, and reconstruction schemes, Walley School and Burnt Ash School; borough surveyor.

Castletown (ISLE OF MAN).—Alterations and extensions, Westhill, for governors of Buchan School for Girls; W. T. Quayle, architect, 29, Athol Street, Douglas, I.O.M.

Cheshire.—Portion of technical college buildings, Crewe, and workshop block and other accommodation, technical college, Northwich, for E.C.; F. A. Browne, county architect, The Castle, Chester.

Cosham.—Social centre, High Street; R. J. Winnicott, Copnor Road, Portsmouth.

Coulsdon.—Offices, Lime works, Marlpit Lane; Sinden Tompkins & King.

Croydon.—Emergency equipment store, Old Town, for B.C.; borough engineer, Town Hall.

Cumberland.—Improvements to Kirkandrews-on-Eden School; J. H. Haughan, architect, 4, Alfred Street North, Carlisle.

Financial Section (*Concluded from page 82*)

Bankruptcy Proceedings—contd.

—Receiving order made January 5th on debtor's own petition.

H. W. Blythe, radio dealer, 64, High Street, Bognor Regis.—Last day for receiving proofs for dividend January 27th. Trustee, Mr. V. R. Fletcher, 8, Old Steine, Brighton, Official Receiver.

G. E. Hughes, electrical engineer, 90, Gibbet Street, Halifax.—Supplemental dividend of 3⅝d. in the £, payable January 23rd at 71, Manningham Lane, Bradford.

W. S. Scott (West End Radio), radio engineer, 452, West Road, Newcastle-upon-Tyne.—First and final dividend of 1s. 8½d. in the £, payable at Gibb Chambers, Westgate Road, Newcastle-upon-Tyne.

J. Bold, radio engineer, 37, Aylesbury Street, Bletchley.—First and final dividend of 5s. 4d. in the £, payable January 19th at 6, The Parade, Northampton.

Reports and Dividends

J. & E. Hall, Ltd., report a net profit for the year to September 30th of £59,826, as compared with £69,280 in the preceding year before charging £11,000 for tax. The ordinary dividend for the year is 8½ per cent., less tax (against 10 per cent.), and £39,447 is carried forward (against £35,901 brought in).

The Engineering & Lighting Equipment Co. is paying an interim ordinary dividend of 6 per cent.

Manx Electric Railway Co., Ltd.—A meeting of the 4½ per cent. first mortgage debenture holders was to be held on Wednesday last to sanction the postponement of interest and to appoint a committee. It is proposed to delay interest instalments due on April 1st, 1938, and up to April 1st, 1940, until October 1st, 1940. The committee will have power to agree with the company further to postpone interest (including arrears) due between October 1st, 1940, and April 1st, 1942, to not later than October 1st, 1942.

The Hydro-Electric Securities Corporation is paying the usual half-yearly dividend on the 5 per cent. class "B" participating preferred shares.

The Electrolytic Zinc Co. of Australasia, Ltd., is maintaining the interim dividend on the preference and ordinary capital at 6 per cent.

Thomas Bolton & Sons, Ltd., are paying an interim dividend of 2½ per cent. (unchanged).

The Singapore Traction Co., Ltd., proposes to pay a final ordinary dividend of 5 per cent., less tax, making 7½ per cent. for the year (against 5 per cent.). The profit for the year to September 30th is £69,252 (against £55,580).

Edmundsons Electricity Corporation, Ltd., announces that the results of the operations of its group of companies during December, as compared with the corresponding month of 1938, show an increase of 12 per cent. of kWh sold.

Darlington.—Factory, Allan Street, for the Thecla Engineering Co., Ltd. (£6,000); A. C. Lynch, architect, 43, Cleveland Avenue, Darlington.

Dukinfield.—Completion of 54 houses, Victoria Farm site; borough surveyor.

Dunston-on-Tyne. — Factory on the North-Eastern Trading Estate; Hetherington & Wilson, architects, County Chambers, Newcastle.

Elliot (SOUTH WALES).—Pithead baths, for Miners' Welfare Commission, Romney House, Tufton Street, London, S.W.1.

Essex.—Completion of junior school at Upminster (£12,097); county architect.

Gateshead-on-Tyne.—Extensions to the works of Carruthers & Son, Ltd., wood turners; F. Davies, architect, 523, Durham Road, Low Fell, Gateshead.

Alterations and extensions to shop premises of Hunter's, Ltd., 182, High Street; A. H. Fennell, architect, West Street, Gateshead.

Extensions to Messrs. Whyman's factory at North-Eastern Trading Estate; Tasker & Child, architects, Trinity Buildings, New Bridge Street, Newcastle.

Sub-station for the Rediffusion Wireless Co., Newcastle; Newcombe & Newcombe, architects, Eldon Square, Newcastle.

Glasgow.—Extensions, Southern Hospital (£72,600); city engineer.

Extensions to Lennox Castle Institution (£40,200); city engineer.

Extensions to Gartloch mental hospital (£200,000); city engineer.

Glastonbury.—Solvent store and spray room, Northover factory; Clark, Son and Morland.

Halifax.—Cleansing depôt, site at Woolshops; borough surveyor.

Hapton Valley (LANCASHIRE).—Pithead baths, for Miners' Welfare Commission, Romney House, Tufton Street, London, S.W.1.

Hebburn-on-Tyne. — A.R.P. machine room for the Bushing Co., Ltd.; A. Anderson, Ltd., builders, Stanmore Road, Newcastle-on-Tyne.

Hotel, Hedgeley Road, for McEwan and Co., Ltd.; Page, Son and Bradbury, architects, 75, King Street, South Shields.

Protective works and shelters at several schools, for Education Committee; T. A. Page, Son, and Bradbury, architects, 75, King Street, South Shields.

Hereford.—Workrooms, Chandos Street, for H. M. Gwatkin; W. W. Robinson & Son, architects, 10, King Street, Hereford.

Hinckley.—Additions to factory, Stoke Golding; Hall and Son.

Keighley.—Extensions to works for Vale Mills (Oakworth) Estate Co., Mytholmes Lane, Oakworth.

Kendray (Barnsley).—New church; Rev. H. R. Rowland, vicar of Ardsley.

Kenilworth.—Decontamination centre at Council's depôt; U.D.C. surveyor.

Kidderminster. — Completing senior schools, Habberley Road and Hurcott Road, for E.C.; Pritchard, Godwin and Clist, architects, Bank Buildings.

Leeds.—Two air-raid shelters in City Square; city engineer.

Liverpool.—Shelters, Old Swan and Garston Technical Institutes, for E.C.; city engineer.

London. — ELTHAM. — Off-licence premises, 552, Westhorne Avenue, for Charles Beasley; Eley and Allen, architects, 83, Powis Street, Woolwich.

LEWISHAM.—Control centre, Town Hall (£15,074): Hy. Kent, Ltd., 51, Beacon Road, S.E.13.

Longbenton.—Communal air-raid shelters; U.D.C. surveyor.

Lowestoft.—Development, Normanston Drive estate; B. W. Youngs & Son.

Boiler-house, Harbour Road; Rist's Wires & Cables, Ltd.

Manchester. — Extensions to Water Street garage (£15,000); city engineer.

Reconstruction of No. 4 Nurses' Home at Withington Hospital for Public Health Committee (£3,200); G. Noel Hill, city architect, Town Hall, Sheffield.

Adaptation and equipment of property, Sale Road, Wythenshawe, as branch library; city engineer.

Milnrow.—Seventeen public shelters for U.D.C.; A. S. Whipp, surveyor, Council Offices.

Monmouth.—Junior instruction centre, Ebbw Vale, for County Education Committee; C. L. Jones, county architect, County Hall, Newport.

Morley.—Extensions to mill for H. Booth & Sons, Ltd., Moorhead Mill, Gildersome.

Newcastle (STAFFORDSHIRE). — Houses, Porthill House Estate, for T.C.; borough surveyor.

Newcastle-on-Tyne. — Public air-raid shelter, Grandstand Road, for the City Council; P. Parr, city engineer.

Warehouse, Sidgate Street, for G. E. Leatherland, Ltd.; J. W. Taylor, architect, St. John Street, Newcastle-on-Tyne.

Hotel, Silver Lonnen; F. M. Dryden, architect, 6, Market Street, Newcastle-on-Tyne.

Alterations to the Clock Hotel, Buckingham Street; Hetherington and Wilson, architects, County Chambers, Westgate Road, Newcastle.

Alterations to the Prince of Wales public house, Shields Road, for J. Thompson; W. and T. R. Milburn, architects, 17, Fawcett Street, Sunderland.

Air-raid shelters at schools for the E.C. (£30,000); T. Walling, director of education, Northumberland Road, Newcastle.

Laboratory, Turner Street, for J. Dampney and Co., Ltd.; T. A. Page, Son and Bradbury, architects, 75, King Street, South Shields.

Northampton.—Extensions to works for Hanwell Engineering Co., Countess Road.

Northants. — Technical College and workshop for managers of the Verdin Technical College, Hartford; F. Anstead Browne, county architect, The Castle, Chester.

North Riding.—Boiler house and workshops at the Mental Hospital for the C.C.; Ward and Leckonby, architects, 9, Museum Street, York.

Paignton.—Licensed premises, Foxhole Road; Swayne & Co., Ltd.

Peterborough. — Factory extensions, Burton Street; British Braid and Boot laces, Ltd.

Storeroom, Lincoln Road; Co-operative Society.

Portsmouth.—Sub fire stations, &c., Somers Road North, and Queen Street, Portsea, for Corporation; city engineer.

Redditch.—New factory in Studley Road; Wm. Veal, architect, 5, Ascot Road, Moseley. E. L. Lewis, Ltd., contractors, Evesham Street, Redditch.

Romford.—Shelters for 450 persons, Rush Green Road and Balgores Lane; borough engineer, Town Hall.

Rothbury (NORTHUMBERLAND). — Rebuilding the Jubilee Hall: C. F. Murphy, architect, Lloyds Bank Chambers, Morpeth, Northumberland.

Rotherham.—Extensions to works for Home Baking Co., Greasborough Road.

Rugby.—Senior girls school, Bilton Road; Warwick county architect.

Ryhope (Co. DURHAM).—Cleansing station for Sunderland Rural District Council; Clive Emerson, housing surveyor, R.D.C. Offices, Sunderland.

St. Helens (LANCS).—Conversion of premises in Baldwin Street into a new branch bank for Wigan Savings Bank, King Street, Wigan; G. H. Bellis & Son, contractors, Eccleston Street, St. Helens.

Salford. — School air-raid shelters (£10,069), for T.C.; borough surveyor.

Sheffield.—Extensions to works for Williams Bros. (Sheffield), Ltd., Dun Fields.

Addition to works for Padley and Venables, Ltd., Hill Street.

Canteen at works for John Shaw, Ltd., Soho Street.

Workshop, office, messroom, &c., Mowbray Street, for W. Turner & Sons, Ltd., Caledonia Works.

Shireoaks (SOUTH YORKSHIRE).—Pithead baths, for Miners' Welfare Commission, Romney House, Tufton Street, London, S.W.1.

South Shields (Co. DURHAM).—Rebuilding scheme at the Scarborough Spa Hotel; T. A. Page, Son and Bradbury, architects, 75, King Street, South Shields.

Stirling.—Omnibus station, Goosecroft; W. Alexander & Sons.

Stoke-on-Trent. — Extensions to St. Mary's China Works, Longton, for T. C. Wild & Sons, Ltd.; Sambrook Bros., Ltd., contractors, Hamil Road, Burslem, Stoke-on-Trent.

Repair and fitting service station at the Michelin Tyre Works, for the Michelin Tyre Co., Ltd., Boothen Estate, Hanley; Wood & Goldstraw, architects, Station Road, Tunstall, Stoke-on-Trent.

Taunton.—New factory at Bishops Hall, for Muirhead & Co.; H. S. W. Stone and Partners, architects, Lloyds Bank Chambers.

Wallsend.—Alterations to the Dock Hotel, for W. B. Reid and Co., Ltd.; Hetherington and Wilson, architects, County Chambers, Westgate Road, Newcastle-on-Tyne.

Two mortuaries; J. A. Blench, borough engineer.

A.R.P. shelters; W. T. Weir, contractor, Coach Open, Howden-on-Tyne.

A.R.P. shelters; R. A. Gofton & Sons, contractors, Front Street, Whitley Bay.

A.R.P. shelters; T. Oates & Co., contractors, 33, Birkett Street, Wallsend.

West Ham.—Extensions to factory, for F. W. Berk & Co., Abbey Mills.

West Lancashire.—Auxiliary fire stations, Aintree and Maghull, for R.D.C.; surveyor, Derby Street, Ormskirk.

West Riding. — Decontamination centre, Harrison Street, Barnoldswick, for C.C.; county architect, County Hall, Wakefield.

Whitby. — Offices at Commondale; Crossley Brothers, Whitby.

Additions to workshops, Glaisdale, for R. Harrison & Son.

FORTHCOMING EVENTS

Institution of Electrical Engineers.—Thursday, January 25th. Institution, London. 6 p.m. Discussion on "Fire-fighting Equipment for Electrical Installations." (Based on the E.R.A. Report.) Introduced by Messrs. H. W. Swann, J. Hacking and R. A. McMahon.

North-Eastern Centre.—Monday, January 22nd. The Newe House, Newcastle-on-Tyne. 6.15 p.m. "Operating Experience with High-voltage Alternators," by Mr. W. D. Horsley.

South Midland Centre.—Monday, January 22nd. James Watt Memorial Institute, Birmingham. 6 p.m. Chairman's address. "Electricity and Civilisation," by Mr. H. Joseph.

North-Western Centre.—Tuesday, January 23rd. Engineers' Club, Manchester. 6.45 p.m. "The Maintenance of Relays and Associated Equipment," by Mr. J. R. Brookman. (To be presented by Mr. H. G. Bell.) "The Application and Limitations of the Inverse-time Overload Relay to the Protection of an 11-kV Network," by Messrs. J. W. Gallop and R. H. Bousfield.

Scottish Centre.—Tuesday, January 23rd. Royal Technical College, Glasgow. 6.30 p.m. Excerpt from chairman's address by Prof. S. Parker Smith.

East Midland Sub-Centre.—Tuesday, January 23rd. Electricity Showroom, Derby. 6 p.m. Chairman's address by Mr. S. J. R. Allwood.

Irish Centre.—Thursday, January 25th. Trinity College, Dublin. 6 p.m. Chairman's address by Dr. T. A. McLaughlin.

North Midland Centre.—Saturday, January 27th. Hotel Metropole, Leeds. 2 p.m. "The Application and Limitations of the Inverse-time Overload Relay to the Protection of an 11-kV Network," by Messrs. J. W. Gallop and R. H. Bousfield.

Royal Institution.—Friday, January 26th. Albemarle Street, London, W. 5 p.m. "Long Distance Broadcasting," by Sir Noel Ashbridge.

Institution of Mechanical Engineers.—Friday, January 19th. Storey's Gate, London. 3 p.m. "A Review of Forty Years' Development in Mechanical Engineering Plant for Power Stations," by Sir Leonard Pearce.

Junior Institution of Engineers.—Saturday, January 20th. Engineers' Club, Manchester. Annual general meeting and smoking concert of the North-Western Section.